WANT TO GO INTO FARMING?

(Extracts from an article in the "The American Boy Magazine", November, 1926)

(The article reports an interview with Mr. Dan Casement, of Manhattan, Kansas. Mr. Casement has a large farm in the cattle and corn country of Kansas, a dairy farm in Ohio and a ranch in Colorado where he breeds Hereford bulls and raises "quarter horses" for use as polo ponies.

He is the son of Brigadier General Casement of Civil War fame and was himself a captain of field artillery in the World War. He is a graduate of Princeton University. More than that he is an exceptionally well balanced expert farmer.)

"If you like outdoor life and like to be your own boss, perhaps farming is your job," Mr. Casement tells you. "But don't plunge into it blindly. If you dislike either hard physical work or hard mental work, you're not cut out for a farmer or a rancher, no matter how much you enjoy blue sky and the smell of freshly plowed fields and the feeling that you don't have to take another man's orders * * *.

"If you're looking for an easy life, don't pick farming. Farming is a fighter's job.

"Successful farming or ranching can't be a matter of blindly following old paths, of stolidly or lazily accepting what comes, A farmer's got to be a scrapper. The right kind of scrapper. A keen observer, a good planner, a hard worker, a man of vision, a man who can't quit!"

Then Mr. Casement asks, "You realize that there's no regular pay day on the farm except for the hired help? * * *

* * * "If you'll use both your hands and your head, I think you can make a go of it. But you've a long pull ahead of you. Be sure before you start that you're picking your job. Do your own deciding, and take time enough to investigate thoroughly both yourself and the work you think you'd like to do."

"Is it absolutely necessary for a fellow to go to College?" I ask.

"No," Mr. Casement says briskly. "But I'd go—for three reasons.

"Here's one. If you go to an agricultural college, you'll accumulate much useful, up-to-date knowledge—valuable to any young farmer, but especially valuable to a town bred boy whose farming experience has been limited to working on farms in vacations.

"And here's another reason. If you go to a good agricultural college, you're likely to meet some big men, men who will help develop vision in you. Some of these men may be on your college faculty. Others may visit the college. And you may meet still others through winning special honors. For instance, if you go to Chicago on a stock-judging team, some older man may invite you to lunch at the Saddle and Sirloin Club and introduce you to a big ranch owner, or a prominent Chicago packer, or an Argentina cattle buyer. Such men give you glimpses of unusual opportunities, drop ideas that spur you on.

"Sometimes, one of them can offer a boy an interesting chance. A promising cub I know, who had just completed his college course, got a chance to go down to Argentina with a bunch of cattle. The cub went, keen for the adventure and thinking he'd learn enough to pay him for the time he'd invest. He did better. He worked on a ranch down there for a year or so; came back home with a thousand dollars in his pockets and more than a thousand dollars' worth of knowledge about Argentine methods in his head.

"Of course, you won't be offered any such chance unless you make yourself good enough so that older men size you up as worth while.

"And here's the third reason, a reason my father gave me when I was a cub. 'As a farmer,' he told me, 'you'll lead a more or less isolated life. Go to college and develop resources within yourself. If you enjoy reading and thinking, you're not likely to get into ruts.' "

* * * * * * * * * * * * *

Dan Casement works right with his men, early and late.

"I want them to respect me as a working leader," he says, "and I like to be in the thick of farming operations."

Mr. Casement's farming operations are carefully planned. He's no hit-or-miss farmer. Each year he records gains and losses, works out his farm budget, makes his plans ahead. Moreover, he has worked out a plan for sharing profits with his men.

* * * * * * * * * * * *

* * * "You needn't give up the idea of owning your own farm if you'll go where land values aren't too much inflated and study prices and conditions carefully before you invest. Decide what you want to try—diversified farming, dairying, cattle raising, fruit growing. Then buy your land, cautiously, intelligently.

"And you need not begrudge the time you'll spend in earning money for your down payment. You'll be learning all the time whether you are working as a general hired man, or managing some one's dairy, or acting as a county agricultural agent, or running a ranch hoodlum wagon—toting along the beds and rustling firewood and water for the cook. Many a man has earned his start in one of these ways." * * *

EDUCATION AND AGRICULTURAL PROMOTION IN JAPAN: I. THE THIRD PAN-PACIFIC SCIENCE CONGRESS[1]

B. M. GONZALEZ

Delegate from the University of the Philippines and the Government of the Philippine Islands to the Third Pan-Pacific Science Congress

HISTORICAL

The need of co-ordinating and systematizing the scientific work in many of the far-flung regions bordering on the Pacific had been long felt by many workers. They had realized that an association would be a means of extending their work through a better understanding which would lead to a systematic co-operation among the scientists engaged in work in the countries of the Pacific.

The First Pan-Pacific Science Congress was called in Hawaii in 1920 under the joint auspices of the Committee on Pacific Investigations of the National Research Council of the United States of America and the Pan-Pacific Union of Hawaii. It was a conference of individual scientists rather than of official representatives of governments and institutions.[2] This Congress was attended by 54 overseas scientists from eight countries, and 39 men engaged in various lines of scientific work in Hawaii. The Philippine delegates numbered four. The main features of the conference were a week devoted to the presentation of papers, a second week devoted to excursions and informal discussions, and a third week to the formulation of plans for future co-operative work.[3]

The second congress was held in 1923 in Australia under the patronage of the Australian Commonwealth government. This was a distinct departure from the Honolulu Congress and gave the organization greater stability and promise of permanency. The number of overseas delegates was 82 from eighteen countries. The Philippines was represented by five delegates. The meetings were held in Melbourne and Sydney and included discussions on co-ordination of scientific work in the Pacific, agriculture, fishing, and stock raising, and the discussion of population problems in the Pacific, with special reference to the native peoples. Before the Australian Congress closed Japan extended an invitation for the third congress. This was held in Tokyo from October 30 to November 11, 1926.

[1] General contribution from the College of Agriculture No. 180.

[2] Gregory, Herbert E. 1924. The Pacific Science Congress. Scientific Monthly **19**: 271–280.

[3] *Vide* Gregory, *loc. cit.*

THE THIRD CONGRESS

The Japan conference was purely official in character. The delegates were invited through the leading scientific organization of their country, usually the National Research Council, wherever such an organization exists, or a government scientific institution of recognized standing, as the Bureau of Science of the Philippines. The number of overseas delegates was 151 distributed as follows:[4]

Australia	22
Canada	5
Chile	1
China	19
France	6
Great Britain	3
Hawaii	8
Hongkong	1
Netherlands	3
Netherlands East Indies	9
New Zealand	5
Papua	1
Peru	1
Philippines	10
Portugal	1
Straits Settlements	3
Sweden	1
U. S. America	44
U. S. S. Republics (Russia)	8
	151

According to their specialties the members may be classified as follows:

Agriculture	6
Botany	20
Chemistry	2
Entomology	1
Ethnology and Anthropology	10
Geodesy and Geophysics	13
Geography	5
Geology	30
Hygiene and Medical Science	9
Oceanography	5
Seismology and Volcanology	7
Veterinary Science	1
Zoology	13
Miscellaneous	29
Total	151

[4] Daily bulletin of the Third Pan-Pacific Congress, Tokyo, 1926.

To give an idea of the extent of scientific work in Japan a classified list of the Japanese members is given herewith:

Architecture	5
Agriculture and Forestry	38
Astronomy and Geophysics	19
Botany	32
Chemistry	25
Engineering	26
Entomology	8
Ethnography, Ethnology, and Anthropology	7
Fishery	7
Genetics	5
Geography	6
Geology	54
Mathematics	7
Medicine and Hygiene	63
Meteorology	8
Mineralogy	5
Oceanography	5
Physics	23
Seismology	6
Veterinary Science	12
Zoology	23
Miscellaneous	30
Total	414

This list does not by any means include all scientists of Japan, but only the more prominent ones who could be spared from their regular work to attend the sessions.

The Congress concerned itself with all conceivable problems affecting the Pacific. More than 400 papers were presented and read. On account of the large number, most papers had to be considerably abbreviated in their presentation, and discussion was possible only in a few instances. Due to the particular wealth of material in Japan, geology and seismology were probably the subjects most intensively discussed. Although foreign delegates in agriculture were comparatively few, there was an unusually large number of local members. The main subjects in agriculture discussed were the effect of volcanic ashes on agriculture in Pacific regions, citrus culture in the Pacific, entomological and phytopathological problems of Pacific countries, genetics in relation to the improvement of crops, especially rice, and of live stock and cereal storage.

Before closing, the Congress passed a number of resolutions the most important of which were:

1. A recommendation to the countries of the Pacific region to take adequate steps for the protection and preservation of rare endemic flora and fauna as well as remarkable geological and mineralogical structures and formations, for their scientific interest as bases for geographical distribution studies.

2. That better co-operation be instituted among Pacific countries in the studies on volcanology and local seismology through interchange of data, publications, and research workers.

3. That the mineral resources of the Pacific region be studied and their extent and quantities be estimated.

4. That a committee be appointed to draw up a comprehensive plan for a thorough investigation of the Pacific coral reefs as to their presence, origin, and growth relations.

5. That the Congress deplores the cultivation of lands with steep gradients, particularly in those regions where scarcity of moisture and other factors prevent a quick return of vegetation, and recommends a systematic study of the damaging results of slope cultivation for the purpose of determining the gradients for various soils types which may be considered safe for cultivation; and further recommends that terracing and similar measures be employed to maintain the same gradients of sloping lands; and still further recommends that sloping lands beyond the safe gradients be maintained in a closed vegetative cover.

6. The Congress recommends the appointment of an international crop protection committee to promote and co-ordinate investigations of crop enemies, and whose main concern shall be:

(*a*) To promote surveys throughout the Pacific area for the purpose of acquiring information as promptly as possible concerning both the known and the probable enemies of crops, and also concerning the parasites and other agencies which may be useful in the control of such crop enemies.

(*b*) To encourage research work necessary for the local control of such enemies, to determine what quarantine action may be warranted, and to develop better methods of inspecting and disinfecting plants and plant products.

(*c*) To promote the development by each country of larger numbers of trained workers in the general field of plant pest survey and control.

(*d*) To obtain agreements and understandings between countries as to giving prompt notification of the appearance of any new and destructive pests, and to secure the co-operation of such countries in the prevention of spread of such pests.

7. That a compilation of practical ideas relative to the needs of native peoples of the Pacific be made by anthropologists and others interested

in this line of work, and that this and its possible utilization be made a subject of prime importance for discussion at the next congress.

Finally, the Congress approved the formation of a permanent organization called the "Pacific Science Association" to which countries bordering on the Pacific and countries which have colonies, possessions, or dependencies in the Pacific region are eligible to membership, and whose main objects are:

(*a*) To initiate and promote co-operation in the study of scientific problems relating to the Pacific region, more particularly those affecting the prosperity and well-being of Pacific peoples.

(*b*) To strengthen the bonds of peace among Pacific peoples by promoting a feeling of brotherhood among the scientists of all the Pacific countries.

As a means of attaining these objects the Association shall organize Pacific Science Congresses.

The Congress adjourned to meet in Java in 1929.

EXCURSIONS

An elaborate series of excursions were planned for the delegates and their ladies—before, during, and after the Congress sessions. These excursions were to places of interest in the Empire from the point of view of beauty, healthfulness, and science. Among the places visited by different groups were Hokkaido, Nikko, Hakone, Ashio, Hitachi, Haronomachi, Matsushima, Sendai, the lake districts around Mount Fuji, Kamakura, Enoshima, Kioroshi, Kasori, Chichibu, Yoshimi, Misaki, Mitaka, Konosu, Kyoto, Nara, Osaka, Kobe, Miyajima, Beppu, Unzen, Shikoku, and Fukuoka.

The writer was fortunate enough to be included in the small party of geologists and anthropologists that visited the island of Hokkaido, the northernmost island of Japan proper. Not being interested particularly in the lines represented by his companions, a separate excursion was made in the country and to the agricultural promotion organizations to gain an idea of the live stock development and general agriculture of Hokkaido, as well as of the two prefectures, Aomori and Iwate, in the northernmost end of the main island, Honshu. His trips to the south extended as far as Beppu on the east side of the south island, Kyushu, and Fukuoka on the north side.

Special pains were taken by the writer to visit animal breeding stations, all the agricultural colleges of the country of university grade, and the five imperial universities, and to gather data and to understand the Japanese system of education, the training of university professors, and other matters relating to university policy and administration, and the promotion of research. Special discussions on some of these subjects will appear in subsequent articles of this series.

GENERAL REMARKS

In comparison with the previous congresses, the Japan conference was on a grander scale, and the delegates were more lavishly entertained. Interest in the proceedings was nation wide and intensively featured in the newspapers of the country. The most important newspapers and magazines dedicated special numbers to the Congress. The delegates were the recipients of many favors and were royally entertained wherever they went. The people in the small towns headed by the town officials, usually turned out en masse to greet the delegates, while school children lined the streets and waved flags and shouted *banzai*. Of special interest as indications of the high esteem in which science is held in Japan were the garden parties and dinners given by the Prince Regent, by Prince Kotohito of Kan-in, Marshal of the Japanese army and patron of the Congress, by Premier Wakatsuki, by Prince Tokugawa, President of the House of Peers, by Barons Shidehara, Mitsui, and Fujita, and by the Mayors of Tokyo, Kyoto, Osaka, and in practically every town to which a delegation went. The votaries of science were the recipients of many material honors from Japanese leaders in government and business.

Scientific institutions, particularly, opened their plants and laboratories for inspection, and many special information bulletins in English were published for the benefit of the visiting scientists.

The estimated expenses of the Hawaii meeting were ₱60,000, those of the Australian ₱150,000, and for the last one in Japan, though no authentic figures are at hand, the appropriation was said to be around ₱500,000.

The Congress was pronounced by all a huge success and the delegates left Japan impressed by the great progress accomplished by the country through the agency of science. The feeling that the Japanese are great organizers and capital entertainers was unanimous.

A COMPARATIVE STUDY OF CORN AND CASSAVA AS FEEDS FOR HOGS[1]

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To encourage and advance interest in the swine industry a plan has been outlined for a systematic study of hog feeding in the Philippines; one phase of the question to be the study of the basal feeds. The work herewith reported is one in a series of experiments on some of the more common feeds, such as corn, cassava, rice bran, corn bran, sweet potatoes, molasses, poñgapong, rice, garbage, etc. The object of this study was to determine the relative influence of corn and cassava on the gains in weight of the pigs and on the profits that may be realized from their use as feeds for hogs.

FEEDING TRIALS

The data herewith presented were obtained from a study of corn and cassava as the basal feeds with rice bran, copra meal, dried shrimps, and a mineral mixture as supplements. The tests were conducted in the Animal Husbandry Department, College of Agriculture, Los Baños. The work was started on April 4, 1925, and was closed on November 25, 1925, covering a period of nearly eight months (235 days). The tests were divided into three feeding periods of 70 days each. The same pigs were used throughout the study.

PIGS USED

The pigs used, consisting of nine barrows and four females, were purchased in Calamba. They were about three months old at the beginning of experiment I. Judging from appearance, they were Berkshire-Native grades, fairly uniform in size, form, and condition.

RATIONS USED

In experiment I (the first 70-day period) the following rations were used to determine what influence or influences each has on three to six months old pigs.

	Lot I	*Lot II*
Corn	40 parts	20 parts
Cassava	——	20 parts[2]
Rice bran	40 parts	40 parts
Copra meal	15 parts	15 parts
Shrimps (dried)	5 parts	5 parts
Total	100 parts	100 parts

[1] Experiment Station contribution No. 412. Read before the Los Baños Biological Club October 28, 1926. Received for publication November 8, 1926.

[2] Three parts of cooked cassava were used to replace one part of corn. When peeled, sliced, and cooked to a soft mush the cassava was found to absorb about 50 per cent water. In this instance, therefore, two parts of raw cassava were really used for every part indicated.

In addition to the above mixture: (*a*) As an appetizer, 0.2 kilogram of molasses was added to the ration of each lot for each feeding, and (*b*) 1 kilogram of the following mineral mixture was added to every 100 kilograms of grain mixture.

Common salt	45 parts
Corn cob charcoal	45 parts
Copperas	2 parts
Glauber's salt	4 parts
Epsom salts	4 parts
Total	100 parts

In experiment II (the second 70-day period) the same rations used in experiment I were given except that they were reversed, that is, lot I ration was given to lot II, and lot II ration given to lot I.

In experiment III (the third 70-day period) the rations used were as follows:

	Lot I	*Lot II*	*Lot III*
Corn, whole	——	30 parts	——
Corn, ground	30 parts	——	——
Cassava, cooked	——	——	30 parts
Rice bran	50 parts	50 parts	50 parts
Copra meal	20 parts	20 parts	20 parts
Total	100 parts	100 parts	100 parts

The same mineral mixture and molasses were used and given in the same manner in experiments I and II.

NATURE OF THE FEEDS UNDER STUDY

Corn. Corn is considered to be the most efficient basal feed for pork production but very often it is not available or for different reasons it is not advisable to use it for hog feeding purposes. The demand for corn for various purposes almost always exceeds the supply. In some regions, as the Visayas and the Cagayan Valley, corn is the staple food of the people, so is too expensive to feed to hogs. But used rightly, corn may be utilized for hog feeding with great success. However, because it is highly relished by pigs and its limitations are not generally known, it is used indiscriminately, frequently to the detriment of the pigs and to the disappointment of the hog feeders.

Cassava. This root grows in all parts of the Islands. Unlike corn it is a hardy plant, easy to grow and to propagate under most field crop conditions. In a paper read before a meeting of the Philippine Society of Technical Agriculturists (1925) Dr. M. L. Roxas of this College quoted statements made by Doctors Mendiola, Vibar, and others, who have made more or less extensive studies of this plant, to the effect that it can be planted any time and in almost any soil. Although it will grow best in

rich light soil, it will do just as well in heavier soils if plowed deep. One or two cultivations, only, are sufficient to control weeds during the early life of the plant. It can be harvested any time, 6 to 18 months from the time of planting. The estimated yield per hectare ranges from 10 to 50 tons, with an average of about 30 tons of roots.

The following table shows the relative composition of corn and cassava.

TABLE 1

Showing the analysis of corn and cassava [a]

FEEDS	WATER	ASH	CRUDE PROTEIN	FIBER	N FREE EXTRACT	FAT
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Corn	13.88	2.16	8.90	2.86	67.28	4.47
Cassava	67.84	4.15	1.13	1.795	25.79	—

[a] Analyzed in the Department of Chemistry.

In computing the cost of the rations, the prevailing prices of feeds at the time in Los Baños were used:

Corn	@	8.08 cents a kilogram
Rice bran	@	6.83 cents a kilogram
Copra meal	@	6.96 cents a kilogram
Shrimps, dried	@	23.53 cents a kilogram
Molasses	@	2.00 cents a kilogram
Mineral mixture	@	12.00 cents a kilogram
Cassava	@	2.00 cents a kilogram

REVIEW OF THE PAST LITERATURE

Conner (1907) reports that pigs fed a ration of cassava supplemented in like amounts with shorts made an average daily gain of 1.23 pounds a pig. When cassava was fed alone, the pigs lost an average of .029 pound a head a day; when fed mixed with sweet potatoes an average of .003 lb.

Hansson (1913), fed, for 12 weeks, four lots of pigs each weighing on an average 47-48 kilograms. Barley, peas, and cassava bran in this test were compared, when fed with whey, boiled Swedish turnips, and peanut cakes. Hansson found that the barley lot made a gain of 0.548 kilogram a head daily; the lot fed barley and pea meal, 0.574; and the lot fed barley with cassava bran, 0.584 kilogram. He concluded that, in feeding value, 1.1 kilogram cassava bran proved equal to 1 kilogram of barley, or .95 kilogram of pea meal. He also found that cassava bran had a beneficial influence on the quality of the pork and on the slaughter weight of the swine.

Gouin and Andouard (1914) demonstrated that if pigs were fed milk in addition to cassava (raw but chopped) it took only 3 pounds of cassava to produce a pound of gain in live weight. Substituting 1.1 pounds of

rice gluten and 2½ ounces of bone meal for the milk ration, 2.9 pounds cassava were required to produce a gain of a pound live weight.

Henke (1919) reports the result of feeding a lot of 3 pigs on 20 pounds green alfalfa daily with free choice of cassava meal (roots sliced, dried, and ground), linseed meal, or tankage. The average daily gain was 0.4 pound, and excluding the alfalfa, 4.6 pounds of feed were required for a pound of gain. Cassava meal constituted 76 per cent of the concentrates eaten, linseed meal, 18 per cent, and tankage, 6 per cent. Another lot of three, three-months old Berkshire pigs were given the choice of 9 different feeds. The percentages selected were as follows: sweet potatoes 38, cassava 22, rolled barley 11, corn 9, algaroba 7, rice bran 4, wheat middlings 3, linseed meal 3, and tankage 3.

Hawaii Experiment Station (1920) reports the result of feeding trials with dairy cattle and hogs, to the effect that cassava meal, when fed in equal proportion with corn, was found to have a feeding value equal to corn. When fed in the fresh state, as 50 per cent of the ration (dry matter basis) it produced scours in dairy cows and pigs. When fed at the rate of 25 per cent and 35 per cent of the ration it was found equal to corn in feeding value.

Henke (1923) reports the results of feeding 3 lots, 7 in each, of Berkshire pigs; they were given rolled barley, cracked corn, wheat middlings, tankage, and green alfalfa in separate self-feeders. In addition, lot 1 received cassava meal, lot 2, cassava molasses meal, and lot 3, dried pineapple waste in self-feeders. During the 12 weeks test, the average daily gains per pig was 1.11 kilograms in lot I, 1.03 kilograms in lot II, and .98 kilogram in lot III. The concentrate ration of lot 1, as balanced by the pigs, consisted of 17 per cent barley, 28 per cent cracked corn, 21 per cent cassava meal, 20 per cent middlings and 14 per cent tankage.

In the Philippines, cassava has been used as a hog feed in the College of Agriculture since 1915, but no results have been published. It is known, however, that certain varieties of cassava fed raw caused the poisoning of some pigs.

MANAGEMENT

Each lot of pigs in these tests had access to a lot one-eighth hectare in area. There were four of these lots and they were used in rotation of ten-day periods in the first two experiments and seven-day periods in the last experiment. A temporary shed was provided in each lot to protect the pigs from the heat of the sun and from rain. They had no place to wallow. Water for drinking was supplied to them in troughs at 11:00 a. m. and 2:00 p. m.

Experiment I was started April 4 when the pigs were about 3 months old. Throughout the feeding period the weather was very pleasant, no extremes of temperature and no storms were recorded. There was enough of second growth camote vines in the pasture lots to last the two lots of

pigs 43 days. The pigs were then turned on to a common grass (*Paspalum conjugatum*) pasture which lasted them well over the close of the experiment. In addition to the grass pasturage, camote soilage was given to each lot, at the rate of from 6-10 kilograms daily amounting to about 210 kilograms.

Experiment II was started on June 18 when the pigs were nearly 6 months old and was closed on August 29, 1925. The lots used were bare of edible vegetation. The weather on the whole was unfavorable. There were brief heavy rains with and without wind, and a long spell of rainy weather, with extremely warm days in between. Each lot received about 378 kilograms of camote soilage during the experiment.

Experiment III was started September 16 and closed on November 25, 1925. Only the nine barrows were used for the tests. They were a little less than 9 months old. The pigs were divided into three as uniform lots as possible. They were practically dry lot fed. They received no camote soilage as there was none available. The weather was, on the whole, very pleasant.

Weighing and feeding

The pigs were fed all they could easily clean up twice daily, at 6:00 a. m. and 4:00 p. m. Besides taking the usual initial and final weights, intermediate weighings were taken. All weights were taken at 4:00 p. m. before the pigs received their afternoon feed.

Results of feeding tests

Table 2 summarizes the results obtained in the three feeding periods.

Table 2 shows that in experiment I:

(1) The two lots made about the same amount and rate of gains, with a very slight advantage in favor of the corn lot. This result indicates that at this age corn can be partly replaced by cassava for pigs. Had corn been replaced entirely by cassava in the ration of lot II in all probability the pigs would not have fared well as the ration would have been too bulky for young pigs to consume. Consequently, they would not have ingested the required amount of nutrients. Had the pigs in both lots been dry lot fed the corn lot would probably have given poorer results than the cassava lot as the corn lot pigs were observed to graze more closely than the cassava lot, indicating that the corn ration was deficient in some ways.

(2) The amount of concentrates required to make a kilogram gain was slightly less in the cassava lot than in the corn lot.

Table 2 shows that in experiment II:

(1) The cassava lot made better gains than the corn lot. During the feeding period, both lots were practically dry lot fed. The limited amount of soilage each lot received in equal proportions was not sufficient in the case of the corn lot either to balance the ration given or to give this ration bulk to properly stimulate digestive functions, or to do both. With

the cassava lot, the soilage given both balanced the ration and gave bulk to it. It may also be noted that there was an increase both in the capacity of the pigs to ingest more feed and to turn out more gains from their ration.

(2) The cassava lot made a saving of .32 kilogram of ration worth ₱0.11 for every kilogram gain made, or ₱11.00 worth of feeds for every 100 kilograms gain. The saving was brought about by the lower price of the ration as well as by the improvement in the rate and amount of gains made.

(3) Both lots failed to make as good gains during this feeding period as they did in the first 70-day feeding period. This result is attributed to the following changes of conditions; namely, (*a*) age of the pigs, (*b*) season of the year, and (*c*) dry lot feeding. It may be expected that the rate of gain decreases and the amount of gain increases as pigs grow, but the decrease in the rate of gain was very much greater than expected and the amount of gain actually decreased showing that age was not the only factor responsible for gain. As the only changes in management were in method of feeding (from pasture to dry lot) and those resulting from change of season, these factors as well as the age of the pigs must be held responsible for decrease in gains.

(4) All the pigs except one in lot II lost weight during the first 10 days of the trial. A typhoon, which occurred from June 22 to 24, was considered as the cause. The loss in weight was not attributed to the reversal of the rations as the change was made immediately after the close of experiment I, and in the intervening five-day preliminary trials all the pigs registered gain in weight. During the storm the pigs were not put into the hog house. Two other typhoons occurred during the feeding period; in these storms, the pigs were driven into the hog house and kept in pens till the storm was over. This practice not only saved the pigs from losing in weight but they made the usual gain. The failure of the pigs to gain and the loss in weight as the result of inadequate protection from the first typhoon entailed a loss in feeds valued at ₱7.83 and in live weight pork valued at ₱4.26, or a total loss of ₱12.09.

In experiment III:

(1) All the three lots made about the same amount and rate of gain. There was, however, a slight advantage shown by the ground corn lot over the other two lots. The increase of 0.01 kilogram over the other lots in the rate of gain is hardly sufficient to offset the expense of grinding. It was observed that almost invariably in the case of the whole corn lot that some whole grains of corn were passed by the pigs. The corn used was Native Yellow Flint variety.

(2) As to feed cost, for each kilogram of gain the cassava lot cost 12 centavos less than whole corn lot, and the ground corn 2 centavos less.

(3) All the pigs in the three lots made better gains than they did in the second feeding period (experiment II). This is explained by the

fact that, on the whole, the weather was very much more favorable—uniformly cool, and no storms—than the weather prevailing in the second feeding period.

SUMMARY

1. With pigs, 3-6 months old on camote pasture on a corn ration, there may be substituted for a part of the corn, one-half in this case, three times its weight of cooked cassava. On dry lot, cooked cassava may be substituted for a greater part of corn.

2. With pigs, 6-9 months old on dry lot, on a corn ration, the substitution of cooked cassava for one half the corn, at ratio of three parts, by weight, of cassava for one part corn, proved beneficial both from the standpoint of gain and economy in feeds.

3. In producing gain, ground corn proved to be slightly better than either whole corn or three parts cooked cassava. From the standpoint of cost of gain, ground corn is equal to cooked cassava and better than whole corn. No difference in the condition and finish of the hogs in the three lots could be observed.

4. Three parts of peeled cooked cassava, which is equivalent to two parts of raw cassava had approximately the same feeding value as one part flint corn grain.

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TABLE 2

Showing summary of results of the three feeding periods

	EXPERIMENT I (1ST 70-DAY PERIOD)		EXPERIMENT II (2ND 70-DAY PERIOD)		EXPERIMENT III (3RD 70-DAY PERIOD)		
	Lot I	Lot II	Lot I	Lot II	Lot I	Lot II	Lot III
	Corn..... 40 Cassava..... 0 Rice bran.... 40 Copra meal... 15 Shrimps..... 5	Corn..... 20 Cassava..... 20 Rice bran.... 40 Copra meal... 15 Shrimps..... 5	Corn..... 20 Cassava..... 20 Rice bran.... 40 Copra meal... 15 Shrimps..... 5	Corn..... 40 Cassava..... 0 Rice bran.... 40 Copra meal... 15 Shrimps..... 5	Corn, ground. 30 Rice bran.... 50 Copra meal... 20	Corn, whole.. 30 Rice bran.... 50 Copra meal... 20	Cassava..... 30 Rice bran.... 50 Copra meal... 20
ımber of pigs.....	6	7	7	6	3	3	3
ıration of test.....	70 days	70 days	70 days	70 days	70 days	70 days	70 days
verage age of pigs.....	3 months	3 months	6 months	6 months	9 months	9 months	9 months
verage initial weight of pigs.....	11.78 kgm.	11.90 kgm.	28.25 kgm.	28.14 kgm.	41.66 kgm.	39.66 kgm.	39.53 kgm.
verage final weight of pigs.....	26.73 "	26.34 "	40.47 "	37.79 "	65.20 "	62.53 "	62.33 "
verage gain per pig.....	14.95 "	14.44 "	12.22 "	9.65 "	23.54 "	22.87 "	22.80 "
verage daily gain per pig.....	0.214 "	0.206 "	0.175 "	0.138 "	0.336 "	0.327 "	0.326 "
eeds consumed per pig.....	43.23 "	38.29 "	79.63 "	65.99 "	148.32 "	148.32 "	147.19 "
eed required per kilogram gain...	2.89 "	2.65 "	6.52 "	6.84 "	6.30 "	6.49 "	6.46 "
eed cost per kilogram gain.....	₱0.24	₱0.18	₱0.45	₱0.56	₱0.45	₱0.47	₱0.35

NOTE: In every case 3 parts of peeled boiled cassava was given for every part denoted in the ration.

THE VITAMIN B CONTENT OF SOME PHILIPPINE FRUITS AND VEGETABLES: III[1]

FRANCISCO DE JESUS

WITH FOUR CHARTS

The work herein reported forms a part of the investigation on the vitamin B content of Philippine fruits and vegetables which is being conducted in the laboratory of Agricultural Chemistry of the College of Agriculture. This experiment was carried out for a period of about ten months, beginning with the summer course in May, 1924.

The experimental methods and the animals and basal ration used were similar to those reported in paper No. II (Santos and Santos, 1926).

The Philippine fruits and vegetables tested for vitamin B were:

1. Mabolo, *Diospyros discolor*
2. Santol, *Sandoricum koetjape*
3. Sincamas, *Pachyrrhizus erosus*
4. Poñgapong, *Amorphophallus campanulatus*

The edible part of the fruits and vegetables was used. Ripe fruits of mabolo and santol were peeled, grated into small pieces and dried in the sun for about four or five successive days, then ground in a meat grinder and pounded into very fine particles in an iron mortar. The prepared materials were placed in small mason jars to keep them from moisture, foreign matter, and insects. All containers were carefully labeled.

The roots of the sincamas and poñgapong were used and the material was prepared by the same process as employed with the fruit.

According to the need of the experiment a certain portion of the prepared material was given to the animals separately in a glass trough in addition to the basal ration.

Glucose was incorporated with the mabolo, santol, and poñgapong to improve the taste.

[1]Portion of thesis presented for graduation, 1925, with the degree of Bachelor of Science in Agriculture from the College of Agriculture, No. 242; Experiment Station contribution No. 413. Prepared in the Department of Agricultural Chemistry under the direction of Dr. Francisco O. Santos.

The relative percentage of composition of the supplements used as analyzed by the Experiment Station of the Department are shown in the following table:

SUPPLEMENT	MOISTURE	CRUDE FAT (ETHER) EXTRACT	ASH	PROTEINS	CRUDE FIBER	CARBOHYDRATES
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Mabolo.....	13.81	5.82	3.26	3.39	7.54	66.18
Santol.....	4.28	15.25	5.15	3.47	9.91	61.94
Sincamas.....	9.86	5.42	3.72	5.54	4.45	71.01
Poñgapong.....	5.47	Trace	5.91	6.69	4.81	77.12

The control sources of vitamin B used, were tikitiki extract (Santos and Collado, 1925), camote leaves (Santos, 1921), and yeast vitamin. The tikitiki was obtained from the Bureau of Science, Manila. The camote leaves were obtained at the College. They were dried well and ground fine in a meat grinder. The yeast was prepared by the Harris Laboratories of New York from fresh brewer's yeast (*Saccharomyces cerrevisiae*) (Osborne and Wakeman, 1919).

One gram each of the tikitiki extract and camote leaves was given daily. One tablet of yeast (0.2 gram) vitamin was supplemented in the last part of the experiment.

The animals were given a synthetic diet which is supposed to contain all essentials except the vitamin in question. On this diet the rats declined in weight. Then the sample to be tested was given in addition to the basal ration according to the need of the experiment. If the supplement contains enough vitamin, weight is recovered, but when deficient, the animal continues to decrease in weight. An increase in weight is considered as showing that the tested food material is a good source of vitamin B, but a decrease shows that it is a poor source. When the rats continued to decline in weight, even when given the supplement, they were treated with a known source of vitamin B, to show that the inability of the animal to recover was not due to other causes than the lack of vitamin B.

EXPERIMENTS AND RESULTS

Protocols of body weight and food intake are given in tables 1, 2, 3, and 4. The body weights of the rats are also presented graphically in charts I, II, III, IV. The behavior of the individual animals is described in detail in the appendix.

Mabolo (table 1 and chart I). Rats 1 ♂, 2 ♂, and 3 ♀ when treated with one-half gram supplement continued decreasing in weight. With the introduction of tikitiki extract they recovered and promptly increased in weight.

This shows that one-half gram mabolo does not contain enough vitamin B for the rats. On one gram mabolo the same animals increased in weight for a short time and then a gradual decrease followed, and rat 3 ♀ died. The increase in weight at the beginning was from unknown cause, probably a change in the diet of the animals coupled with favorable climatic factors. With the substitution of known source of vitamin B, rats 1 ♂ and 2 ♂ improved and regained their weights. Rats 4 ♂ and 5 ♂ on one gram mabolo supplement with the basal ration, directly decreased in weight. On the treatment of one gram camote leaves they increased in weight. Hence, one gram mabolo cannot furnish enough vitamin B for the rats. When two grams mabolo were given to rats 1 ♂, 2 ♂, 7 ♀, and 8 ♀ after they had recovered with a known source of vitamin B, they again decreased in weight and became weak, except rat 7 ♀ which increased in weight slightly at the beginning. They regained their weights and grew when given a known source of vitamin B. Rat 2 ♂ became sick and died. Rat 6 ♀ which had decreased in weight on the basal ration, when given two grams mabolo continued to decrease. So even two grams mabolo does not contain enough vitamin B to enable the rats to grow.

Santol (table 2 and chart II). On one gram supplement in addition to the basal ration, rats 9 ♀, 10 ♂, and 11 ♂ showed a gradual increase in weight. Then they decreased slightly for some days, and then maintained almost constant weights. When two grams supplement were given, they again increased a little; they maintained this weight constant, thereafter. Yeast enabled them to grow better. Hence, santol in doses of one to two grams seems to contain enough vitamin B for maintenance, but not enough for growth.

Sincamas (table 3 and chart III). Among the materials studied, sincamas was found to be the best source of vitamin B. On a supplement of one gram in addition to the basal ration the animals (rats 12 ♂, 13 ♀, and 14 ♀) showed a gradual increase in weight. When two grams supplement were given, they again slowly increased in weight. The result shows that sincamas is a relatively good source of vitamin B.

Poñgapong (table 4 and chart IV). The results on this supplement were almost identical to those obtained with mabolo. With the treatment of one gram poñgapong, after subsisting on a basal ration, rats 15 ♂, 16 ♀, and 18 ♀ slightly decreased in weight at first. Then a gradual increase in weight followed, and then they quickly decreased again, and rat 16 ♀ died. Rat 17 ♀ on one gram poñgapong with the basal ration continued to decrease in weight and died. When camote was given to rats 15 ♂, and 18 ♀ in place of poñgapong an increase in weight was attained. The result shows that one gram poñgapong is not sufficient to cause the growth of the animals. Then camote was replaced by two grams poñgapong and again the rats decreased gradually in weight. Rat 19 ♂, which was directly treated with two grams poñgapong without a basal ration decreased in

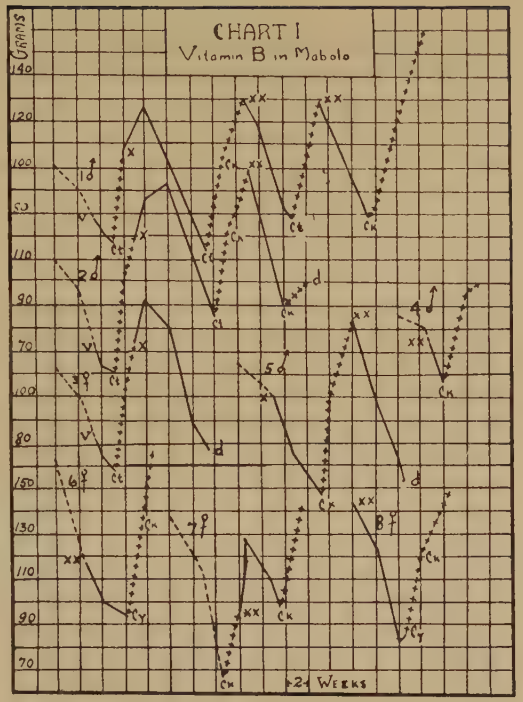
body weight. Rats 15 ♂, 18♀ , and 19 ♂ on the administration of camote in place of poñgapong increased in weight, showing that poñgapong is poor in vitamin B.

SUMMARY OF CONCLUSIONS

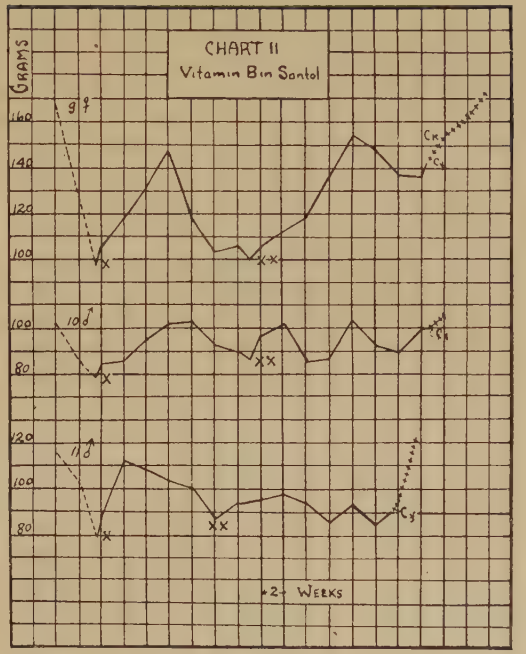
1. Mabolo and poñgapong were found to be comparatively deficient in vitamin B. Even on two grams supplement in addition to the basal ration, the decrease in weight of rats because of lack of vitamin B was not checked. The animals recovered on the addition of a known source of vitamin B.

2. A daily supplement of two grams santol enabled the rats to maintain their weight, but not to grow.

3. Sincamas was found to be a relatively good source of vitamin B. A supplement of one gram daily enabled the rats which were decreasing in weight because of lack of vitamin B to recover and to grow.



Key: - - - - - - - - =Growth on the basal ration alone.
———— =Growth on the basal ration plus the supplement.
+ + + + + =Growth on the basal ration plus the control source of vitamin B.
V =½ gram of daily supplement in addition to the basal ration.
X =1 gram of daily supplement in addition to the basal ration.
XX =2 grams of daily supplement in addition to the basal ration.
Ct =1 cc. tikitiki extract.
Ck =1 gram powdered camote leaves.
Cy =0.2 gram yeast vitamin.
d =Died.



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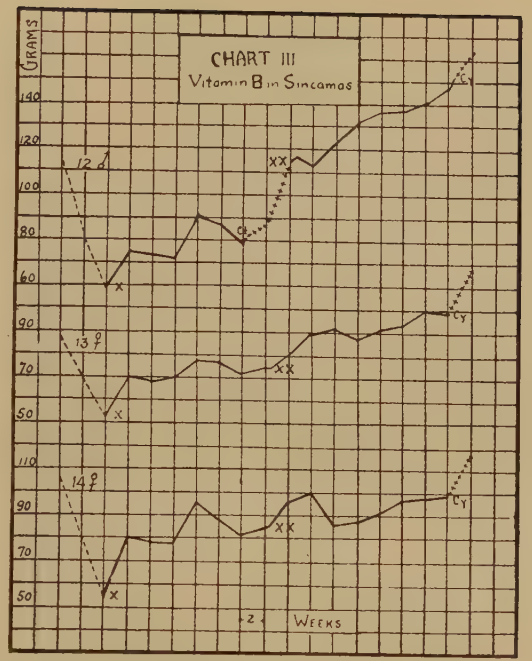
Cy =0.2 gram yeast vitamin.



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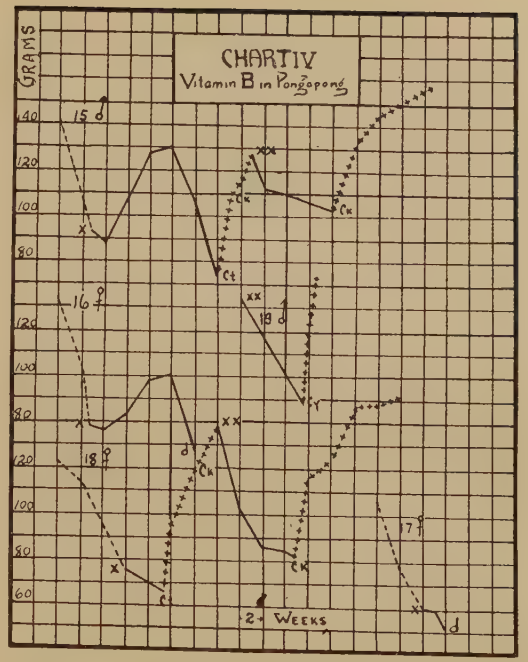
Cy =0.2 gram yeast vitamin.



Key: - - - - - - - - =Growth on the basal ration alone.
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+ + + + + =Growth on the basal ration plus the control source of vitamin B.
X =1 gram of daily supplement in addition to the basal ration.
XX =2 grams of daily suplement in addition to the basal ration.
Ct =1 cc. tikitiki extract.
Cy =0.2 gram yeast vitamin.
d =Died.

TABLE 1

Mabolo: Body weight and bi-weekly intake of basal ration

RAT 1 ♂			RAT 2 ♂			RAT 3 ♀			RAT 6 ♀		
Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration
1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*
June 4	101	——	June 4	110	——	June 4	113	——	December 17	163	——
June 18	90	57	June 18	97	76	June 18	100	83	December 31	128	80
June 28	76v	——	June 28	72v	——	June 28	82v	——	January 3	118xx	——
July 2	72	18	July 2	65	18	July 2	74	30	January 13	100	33
July 9	68Ct	——	July 9	60Ct	——	July 9	68Ct	——	January 27	93Cy	52
July 16	109x	54	July 16	101	99	July 16	101	88	February 7	132Ck	——
July 30	127	141	July 23	120x	——	July 23	125x	——	February 10	147	124
August 13	105	92	July 30	138	157	July 30	142	150	February 14	167	——
August 27	81	46	August 13	144	156	August 13	130	120			
September 6	65Ct	——	August 27	112	70	August 27	87	63		RAT 7 ♀	
September 10	90	55	September 10	85Ct	32	September 2	76d	——			
September 17	102Ck	——	September 17	123Ck	——				December 8	138	——
September 24	115	159	September 24	130	154		RAT 5 ♂		December 20	114	35
October 1	130xx	——	October 1	150xx	——				January 3	69Ck	25
October 8	118	137	October 8	134	154	September 1	115	——	January 13	98xx	——
October 22	81	49	October 22	90Ck	48	September 3	122	——	January 17	119	119
October 25	78Ct	——	November 1	100d	——	September 17	106	70	January 24	128	——
November 5	100	67				September 20	100x	——	January 31	110	103
November 15	130xx	——		RAT 4 ♂		October 1	76	19	February 7	98Ck	——
November 19	119	111				October 15	64	36	February 14	128	101
December 2	96	55	September 1	86	——	October 18	58Ck	——	February 17	141	——
December 13	78Ck	——	September 3	93	——	October 29	100	103			
December 16	81	42	September 17	80	62	November 12	136xx	142		RAT 8 ♀	
December 31	118	129	September 20	75xx	——	November 26	99	72			
January 13	152	150	October 1	57Ck	17	December 9	71	21	December 17	142xx	——
January 17	160	33	October 15	97	115	December 13	64d	——	December 31	123	78
			October 22	100	——				January 13	81	21
									January 17	85Cy	——
									January 27	120Ck	129
									February 10	144	147
									February 14	148	——

Key: v = ½ gram of daily supplement in addition to the basal ration.
x = 1 gram of daily supplement in addition to the basal ration.
xx = 2 grams of daily supplement in addition to the basal ration.
Ct = 1 cc. tikitiki extract.
Ck = 1 gram powdered camote leaves.
Cy = 0.2 gram yeast vitamin.
d = Died.

TABLE 2

Santol: Body weight and bi-weekly intake of basal ration

RAT 9 ♀			RAT 10 ♂			RAT 11 ♂		
Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration
1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*
June 4	168	———	June 4	102	———	June 25	116	———
June 18	126	51	June 18	87	58	July 9	101	53
June 28	97x	———	June 28	79x	———	July 19	79x	———
July 2	105	36	July 2	85	34	July 23	87	48
July 16	118	92	July 16	87	81	August 6	112	132
July 30	131	129	July 30	96	110	August 20	109	94
August 13	148	175	August 13	102	133	September 3	103	48
August 27	118	85	August 27	103	96	September 17	100	49
September 10	104	74	September 10	93	64	October 1	87xx	37
September 24	107	80	September 24	90	66	October 15	94	74
October 1	100xx	———	October 1	87xx	———	October 29	95	59
October 8	106	67	October 8	98	67	November 12	98	64
October 22	112	95	October 22	102	88	November 26	94	64
November 5	119	74	November 5	86	51	December 9	86	67
November 19	138	108	November 19	87	70	December 23	92	90
December 2	154	119	December 2	104	96	January 6	85	71
December 16	149	117	December 16	92	99	January 17	90Cy	———
December 31	137	99	December 31	90	82	January 20	94	98
January 13	136	101	January 13	100	102	January 31	122	———
January 17	142Cy	———	January 17	100Cy	———			
January 27	153Ck	159	January 27	106	107			
February 10	161	123						
February 21	172	———						

Key:

x = 1 gram of daily supplement in addition to the basal ration.
xx = 2 grams of daily supplement in addition to the basal ration.
Ck = 1 gram powdered camote leaves.
Cy = 0.2 gram yeast vitamin.

TABLE 3

Sincamas: Body weight and bi-weekly intake of basal ration

RAT 12 ♂			RAT 13 ♀			RAT 14 ♀		
Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration
1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*
May 21	114	———	May 21	88	———	May 21	106	———
June 4	81	64	June 4	69	45	June 4	80	43
June 18	59x	39	June 18	53x	25	June 18	54x	22
July 2	75	81	July 2	70	93	July 2	80	106
July 16	74	45	July 16	68	49	July 16	79	70
July 30	72	55	July 30	70	55	July 30	78	60
August 13	91	96	August 13	78	81	August 13	96	94
August 27	88	84	August 27	77	69	August 27	89	77
September 10	79	55	September 10	73	45	September 10	81	54
September 13	81Ct	———	September 24	75	76	September 24	85	69
September 24	87	82	September 27	75xx	———	September 27	86xx	———
October 4	115xx	———	October 8	80	98	October 8	96	85
October 8	117	111	October 22	90	102	October 22	100	96
October 22	114	82	November 5	92	88	November 5	87	65
November 5	124	92	November 19	88	84	November 19	88	68
November 19	133	104	December 2	91	90	December 2	91	79
December 2	137	104	December 16	94	88	December 16	97	90
December 16	138	109	December 31	100	105	December 31	98	124
December 31	141	114	January 13	99	100	January 13	99Cy	110
January 13	148	141	January 17	102Cy	———	January 27	118	116
January 17	153Cy	———	January 27	117	125			
January 27	164	143						

Key:

x = 1 gram of daily supplement in addition to the basal ration.
xx = 2 grams of daily supplement in addition to the basal ration.
Ct = 1 cc. tikitiki extract.
Cy = 0.2 gram yeast vitamin.

TABLE 4

Poñgapong: Body weight and bi-weekly intake of basal ration

RAT 15 ♂			RAT 16 ♀			RAT 18 ♀		
Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration	Date	Body weight	Intake of basal ration
1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*	1924–1925	*grams*	*grams*
June 4	141	——	June 4	131	——	June 25	122	——
June 18	108	63	June 18	105	56	July 9	115	59
June 25	93x	——	June 25	79x	——	July 23	93	35
July 2	89	38	July 2	77	38	August 6	75x	41
July 16	106	98	July 16	81	71	August 20	70	36
July 30	128	117	July 30	99	110	August 30	66Ct	——
August 13	130	124	August 13	100	99	September 3	92	74
August 27	106	77	August 27	68d	38	September 17	119Ck	128
September 10	72Ct	34				October 1	139xx	181
September 17	108Ck	——		RAT 17 ♀		October 14	103	66
September 24	115	139				October 29	86	53
October 1	128xx	——	May 21	106	——	November 12	85	66
October 8	112	112	June 4	76	31	November 19	81Ck	——
October 22	110	61	June 18	60	41	November 26	115	97
November 5	107	68	June 25	58x	——	December 9	124	103
November 19	102Ck	55	July 2	51d	21	December 23	147	122
December 2	132	159				January 6	148	113
December 16	145	139		RAT 19 ♂		January 17	152	102
December 31	150	137						
January 13	156	131	December 8	135xx	——			
January 17	158	——	December 9	131	——			
			December 23	117	68			
			January 6	100	34			
			January 17	88Cy	——			
			January 20	122	70			
			January 27	143	——			

Key:

x = 1 gram of daily supplement in addition to the basal ration.
xx = 2 grams of daily supplement in addition to the basal ration.
Ck = 1 gram powdered camote leaves.
Ct = 1 cc. tikitiki extract.
Cy = 0.2 gram yeast vitamin.
d = Died.

APPENDIX

Detailed description of the behavior of the individual rats.

Mabolo as source of vitamin B. Eight animals were treated with this supplement.

From June 4, rat 1 ♂, with an initial weight of 101 grams, gradually decreased in weight on the basal ration. After 24 days it was given a daily supplement of one-half gram. Two days later, the rat lost its appetite and continued decreasing in weight, so that on June 9 it weighed only 68 grams. At this time tikitiki extract was added to the supplement and after a week the rat fully recovered and weighed 109 grams. Then the tikitiki was replaced by one gram mabolo. The rat continued increasing in weight up to July 30 and then gradually decreased to 65 grams by September 6 when it was hardly able to stand. Tikitiki extract was again substituted for mabolo and when the supply was exhausted camote leaves were used, instead. By October 1 the rat had recovered in weight. From this period, two grams mabolo were given instead of camote leaves and the rat's weight again decreased to 78 grams. When treated with tikitiki extract the rat immediately recovered and by November 15, weighed 130 grams. Then tikitiki was cut off and the same amount of mabolo supplement was introduced and by December 13 the weight had again decreased to 78 grams. Then camote leaves were given and by January 17 the weight had increased to 160 grams.

Rat 2 ♂, with a weight of 110 grams, after 24 days on a basal ration alone, weighed 72 grams. Then it was given one-half gram supplement and by July 9 the weight was only 60 grams. At this period the rat was weak, and was unable to stand. It dragged both hind legs. On the administration of tikitiki extract instead of mabolo, it recovered and the weight increased to 120 grams by July 23. The tikitiki supplement was cut off and was replaced with one gram mabolo, and by September 10 the weight had decreased to 85 grams. On the treatment with tikitiki extract and later with camote leaves the animal recovered the lost weight and further increased to 150 grams. Then two grams mabolo supplement were given instead of tikitiki extract and by October 22 the rat weighed only 90 grams, and was badly paralyzed. When camote leaves were introduced, the animal, after a week, slightly increased in weight, but died on November 1.

Rat 3 ♀, on the basal ration, decreased in 24 days from a weight of 113 grams to 82 grams. Then one-half gram supplement was added to the basal diet, but the rat continued to decrease in weight. After 11 days it was very weak. Tikitiki extract was given in place of mabolo supplement and in 14 days, by July 23, the rat increased in weight up to 125 grams. Then one gram mabolo was given instead of tikitiki extract. The rat gradually decreased in weight until September 2 when it died weighing 76 grams.

Rat 4 ♂, with a weight of 86 grams, after 19 days on a basal ration, decreased in weight to 75 grams. On the administration of two grams supplement it continued to decrease to 57 grams until October 1. Recovery was attained through the administration of camote leaves.

Rat 5 ♂, with an initial weight of 115 grams on September 1, decreased in weight to 100 grams after 19 days on the basal ration. Even when a daily supplement of one gram mabolo was given in addition to the basal diet, the rat gradually decreased in weight to 58 grams by October 18. On the substitution of camote for mabolo the animal recovered, and by November 12 had attained a weight of 136 grams. Then camote was cut off and two grams mabolo were given. Again the animal failed to grow and decreased in weight to 64 grams by December 14, when it died.

Rat 6 ♀, with a weight of 163 grams, gradually decreased to 118 grams after 17 days on the basal ration. On treatment with two grams of supplement the rat after 24 days

slowly decreased to a weight of 93 grams. On the administration of yeast vitamin, and later, camote in place of mabolo, the rat gradually increased in weight to 167 grams by February14.

Rat 7 ♀, with a weight of 138 grams declined to 69 grams after 24 days on the basal ration. At this time, it was very weak, so camote leaves were given for 10 days, during which time the animal increased a little in weight. From January 13, two grams mabolo were given in place of camote and the rat gradually increased in weight again to 128 grams, but soon decreased to 98 grams. Then camote was given instead of mabolo and after 10 days the rat had recovered and weighed 141 grams.

Rat 8 ♀, with an original weight of 142 grams on December 17, was given directly two grams of supplement in addition to the basal diet. The rat lost her appetite and decreased in weight, until by January 17 she weighed only 85 grams. Then 0.2 gram yeast vitamin was substituted for mabolo. The animal gradually increased in weight until by February 14, it weighed 148 grams.

Santol as source of vitamin B. In this supplement three animals were used. Rat 9 ♀, with an initial weight of 168 grams on June 4, gradually decreased to 97 grams after subsisting on the basal ration for 24 days. Then one gram daily supplement was given and the animal rapidly increased in weight until by August 13 it weighed 148 grams. From this period the weight gradually decreased to 104 by September 10, which weight was practically maintained until October 1. Then the supplement was increased to two grams. The weight increased until by December 2 it was 154 grams. From this date, weight decreased to 137 grams by December 31, and stayed almost the same up to January 13. Yeast vitamin was then substituted and later camote leaves in place of santol and the animal gradually increased to a weight of 172 grams by February 21.

Rat 10 ♂, weighing 102 grams on June 4, slowly decreased to 79 grams body weight on the basal ration. On the administration of one gram supplement the weight rapidly increased to 103 grams by August 27. Then it slowly decreased to 87 grams by October 1. On the administration of two grams supplement the animal increased in weight to 102 grams in 21 days, but again decreased to 86 grams. Again it increased until by December 2 the weight was 104 grams. From this date till January 17 almost constant weight was maintained. Yeast vitamin was administered.

Rat 11 ♂, which had a weight of 116 grams on June 25, gradually decreased to 79 grams after 24 days on the basal diet. On the supplementary dose of one gram, the animal increased in weight up to August 6. Then there was a slight decrease until October 1 when the weight was 87 grams. Two grams supplement was then given daily and the rat slightly increased in weight for a short time and then remained practically at constant weight until January 17. Then yeast vitamin was given as supplement, instead of santol, and in two weeks the animal attained a weight of 122 grams.

Sincamas as source of vitamin B. Three rats from the same litter were used for this supplement.

Rat 12 ♂, from an initial weight of 114 grams on May 21, decreased to 59 grams by June 18 on the basal ration alone. Then one gram supplement was given and the rat increased to 75 grams, by July 2. It maintained practically constant weight till July 30. By August 13 the weight had increased to 91 grams. Then the weight rapidly decreased to 79, by September 10. The rat moved slowly and was weak and ate very little food. On September 13 tikitiki extract was given and by October 4 the weight had increased to 115 grams. Then tikitiki extract was cut off and, instead, two grams sincamas were given to the rat. The weight increased slowly to 153 grams, and when yeast was given the increase in weight continued.

Rat 13 ♀, with an initial weight of 88 grams on May 21, decreased to 53 grams after subsisting on the basal ration for 27 days. Then one gram supplement was given and its weight increased to 70 grams by July 2, which weight was kept almost constant till September 27. Then two grams supplement was given. The weight slowly increased to 90

grams by October 22, and remained almost constant till January 17. Yeast caused further improvement in weight.

Rat 14 ♀, with an initial weight of 106 grams, decreased to 54 grams in 27 days on the basal ration alone. On a supplementary dose of one gram daily the weight increased to 80 grams by July 2. This weight was maintained, almost, till July 30, after which it gradually increased until by August 13 it was 96 grams, then gradually decreased to 86 grams. Then two grams supplement was administered. The animal gradually improved and attained a weight of 100 grams. This weight was kept almost constant till January 13. Yeast vitamin enabled the animal to further increase in weight.

Poñgapong as source of vitamin B. Five animals were treated with this supplementary diet.

Rat 15 ♂, with an initial weight of 141 grams, decreased to 93 grams in 21 days on the basal ration. From June 25, a daily supplement of one gram was given. Then for 42 days the rat gradually increased in weight to 130 grams. Then there was a decrease and by September 10 the weight was 72 grams. Tikitiki extract and, later, camote was substituted for the supplement and by October 1 the rat weighed 128 grams. Then the camote was cut off and two grams supplement were given. The rat showed a gradual decrease in weight until by November 19 it had decreased to 102 grams. On the administration of camote in place of poñgapong, the weight gradually increased to 158 grams by January 17.

Rat 16 ♀ began on June 4 with an initial weight of 131 grams. After 21 days on the basal ration the weight had decreased to 79 grams. Then one gram supplement was given and the rat slowly increased in weight until by August 13 it weighed 100 grams, then it decreased in weight and died August 27 at a weight of 68 grams.

Rat 17 ♀, with a weight of 106 grams, was started on the ration May 21. After 34 days on the basal ration the rat had decreased to 58 grams. Then a supplementary dose of one gram was given, and the animal further decreased to 51 grams by July 2, when it died.

Rat 18 ♀, after subsisting on the basal ration for 42 days, decreased from a weight of 122 grams to 75. Then one gram daily supplement was given and by August 30 the weight had decreased to 66 grams. Tikitiki extract and, later, camote was substituted for poñgapong to cause recovery. By October 1 the animal had improved and weighed 139 grams. Then camote was cut off and again poñgapong was given. Again, the animal gradually decreased in weight until by November 19 it weighed 81 grams. With the substitution of camote leaves the rat was again able to recover. On January 17 it weighed 152 grams.

On December 8, rat 19 ♂, with a weight of 135 grams, was given directly two grams supplement. The animal declined and by January 17 weighed 88 grams. Yeast vitamin was substituted for the supplement and the animal rapidly increased in weight to 143 grams by January 27.

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A COMPARATIVE STUDY OF THE PALATABILITY OF SOME COMMON PHILIPPINE FORAGES[1]

MAXIMO E. PEPA

INTRODUCTION

It is an admitted fact that the palatability of feeds is an important factor in the feeding of animals. If feeds are palatable, a greater amount is consumed. And it is generally recognized that palatable feeds stimulate digestion and aid in keeping the digestive tract in good condition.

It is also true that to secure the best results in feeding, the chemical composition of feeding stuffs should be recognized.

In the Philippines, farm animals are fed chiefly on grass, various species of which grow luxuriantly and are found in abundance in many localities of the Islands. It is a common practice either to turn the animals out to pasture or give them cut forage of some kind after working hours.

Because of this practice, a knowledge of the merits of forage and pasture plants is important. With a view to securing data on the palatability and chemical analysis of such feeds, this work was undertaken.

Review of past literature

So far, very little work has been done on the determination of the palatability of the forages treated in this paper.

Feeding tests of Napier grass for dairy cattle were carried out by Breakwell (1917) at the Hawkesbury Agricultural College, at Wollongbar, and the Grafton Experiment Farms. In each test the animals ate the grass readily.

At the Lamao Station of the Philippine Bureau of Agriculture, (1924), a comparative test was run to determine the percentage of consumption of Napier grass and Guinea grass when cut at different ages of growth. In this feeding test, bullocks were used. The grasses were cut at the age

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of 20, 30, 40, 45, 50, 60, 75, and 90 days. The results of the test for grasses used in these experiments are given in the following table:

TABLE 1

Showing the amount, when cut at certain ages, of Napier grass and Guinea grass consumed by animals

GRASSES	PERCENTAGE OF FEED GRASS CONSUMED BY ANIMALS WHEN CUT AT							
	20 days old	30 days old	40 days old	45 days old	50 days old	60 days old	75 days old	90 days old
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Napier grass	100	86	78	74	59	37	48	41
Guinea grass	100	100	91	86	65	69	54	49

The table below shows the chemical analysis of forages referred to in this paper as reported by different workers.

TABLE 2

Chemical analysis of some forages

AUTHORS	FEEDING STUFFS	NO. OF SAMPLES	MOISTURE	CRUDE FATS	ASH	CRUDE PROTEIN	CRUDE FIBER	NITROGEN FREE EXTRACT
			per cent	*per cent*	*per cent*	*per cent*	*per cent*	
Henry and Morrison (1917)	Guinea grass	1	71.50	0.70	2.60	2.20	10.90	12.10
Shorey, E. C. (1906)	Guinea grass	2	64.48	0.31	3.87	1.95	9.98	19.41
Jacobson (1916)	Guinea grass	—	77.85	0.57	2.85	3.34	7.30	8.09
Watts, F. (1902)	Guinea grass[a]	—	74.91	0.20	2.78	1.20	9.88	11.03
Breakwell (1917)	Napier grass	—	61.81	0.29	2.92	2.92	14.77	17.29
Shorey (1906)	Culape, or carabao grass	4	71.36	0.66	1.86	1.43	9.21	15.48

[a] This grass was sampled for analysis when flowering, with the seeds beginning to set in.

Objects of the work

The objects of this investigation were: (*a*) To determine the comparative palatability of some forages as shown by consumption records; and (*b*) to compare the proximate chemical constituents of said forages.

Time and place

The work was carried out in the Animal Husbandry Department, College of Agriculture, University of the Philippines. It covered a period of 9 months, from July, 1923 to March, 1924.

MATERIALS AND METHODS

Animals

The animals used in this experiment were three steers owned by the College of Agriculture. They were of native breed and approaching maturity. These animals were known by the names of Lazaro, Tuntuñgin and Tasio. The weights of the animals at the start of the experiment were as follows: Lazaro 306.6 kilograms; Tuntuñgin 293.6 kilograms; and Tasio 300.0 kilograms.

Grasses

The description and distribution of grasses used in this experiment, are, with some exceptions, those given by Merrill. (1912.)

Guinea grass (*Panicum maximum*, Jacq.). This is an erect, rather coarse perennial grass, 2 to 3 meters high. The nodes of the leaves are hairy. It is a native of Africa and, according to Piper (1911), was introduced into the Islands in 1907. It is cultivated to some extent as a forage grass.

Napier grass (*Pennisetum purpureum* Schum.).A coarse perennial grass attaining a height of 5 meters or more. It is a native of Tropical Africa, and, according to Wester (1920), was first introduced in the Philippines in 1918.

Cogon (*Imperata cylindrica* Linn.) An erect grass, 30 to 80 centimeters high, stem solid and rather slender. Cogon is very widely distributed over the Philippines in open, rather dry land.

Culape, or carabao grass (*Paspalum conjugatum* Linn.). Most abundant shade grass in the Philippines occurring especially in cultivated ground, as abaca plantations.

Batadbatadan (*Andropogon halapensis propinquus* Kunth.). A coarse grass in large clumps, 2 to 3 meters high growing on well-drained soil especially.

Guinea grass and Napier grass were harvested from the College lots that were kept to supply forage for animals. The other grasses were growing wild and were taken from various places on the College grounds.

Barn and feed boxes

The animals were kept in an inclosure about 11 meters long and 7 meters wide, free from vegetation of any kind. At one end of this inclosure was a shed with a nipa roof covering a space 6 meters long and 4 meters wide, under which the animals were sheltered and given feed.

Six feeding boxes were used. They were each about 1 meter long, 0.7 meter wide and 0.7 meter deep. The boxes were raised about 60 centimeters above the ground to prevent the feeds from being trampled by the animals while feeding. They were arranged in a row at a distance of about 1.5 meters from each other.

Balance

A Fairbanks balance was used for weighing the grasses. It was placed inside the barn in a separate compartment.

Methods of feeding

Feeds were supplied to the animals twice daily. The grasses to be fed during the day were weighed and placed separately in each feed box between 5:30 and 6:30 a. m. From about 5:00 to 6:30 p. m. of the same day the grasses that remained in the feed boxes were weighed separately, and these weights subtracted from the morning weights of the corresponding grasses to determine the consumption for the day. The night feeds were weighed and placed separately in the feed boxes between 5:00 and 6:00 p. m. The left-overs from this feeding were then weighed and subtracted from the previous weights to obtain the consumption of each grass during the night. The sum of the amounts of grasses consumed during the day and during the night gives the daily consumption of the grasses. It may be mentioned that an error creeps in the calculation as any drying of the unconsumed forage is recorded as amount consumed. This may affect the forages differently but the effect is not believed to be great enough to modify their relative standing.

The different grasses were given at the same time to enable the animals to select the one they cared to eat. The grass was supplied fresh so as to maintain the natural succulent character when used for feeding purposes. To eliminate another possible source of error in finding the amount consumed, long grass was cut into short pieces to prevent its falling to the ground. The animals fed at will and no restriction was made that would limit the amount of grass they consumed. A handful of common salt was given each animal every other day. The animals were watered twice daily, morning and afternoon.

Grasses used

Eight experiments were carried out in this work. They were conducted at times when certain kinds of grasses to be studied were available.

Except when otherwise stated, the grasses used in this investigation were cut at what is generally considered as the right age or size for feeding, that is, the plants were neither too young nor very old.

Guinea grass. Cut when about 30 to 80 centimeters high; not in bloom.

Napier grass. Cut when about 100 to 175 centimeters high; not in bloom.

Cogon grass. Cut when about 30 to 50 centimeters high; not in bloom.

Culape, or carabao grass. Cut when about to flower or when flowering.

Batadbatadan. Cut before it attained a height of 175 centimeters; not in bloom.

Experiments

In the first experiment, the grasses used were Napier grass, Guinea grass, and cogon. The experiment covered a period of 15 days.

In the second experiment, the grasses used were Napier grass and cogon. The experiment covered a period of 14 days.

In the third experiment, the grasses used were the same as those of the second, but in this case Napier grass was fed at the flowering stage. The experiment covered a period of 18 days.

In the fourth experiment, the grasses used were Guinea grass and cogon. The experiment covered a period of 20 days.

In the fifth experiment, the grasses used were Guinea grass and Napier grass. The experiment covered a period of 6 days.

In the sixth experiment, the grasses used were Guinea grass and culape. The experiment covered a period of 22 days.

In the seventh experiment, the grasses used were culape and batad-batadan. The experiment covered a period of 13 days.

In the eighth experiment, the grasses used were Napier grass and culape. The experiment covered a period of 13 days.

Analysis of feeds

Samples of each of the grasses were secured every 10 days from the feeds given to the animals. These were analyzed by the Department of Chemistry. In general, analyses were made according to the methods adopted by the Association of Official Agricultural Chemists (1917).

Weighing animals

The animals were weighed at the beginning of each experiment and every 10 days thereafter. This was considered necessary to keep track of the condition of the animals during the progress of the work.

TABLE 3

Showing the weight of the animals

DATE	LAZARO		TUNTUNGIN		TASIO	
	Weights	Increase or decrease	Weights	Increase or decrease	Weights	Increase or decrease
1923	*kgm.*	*kgm.*	*kgm.*	*kgm.*	*kgm.*	*kgm.*
August 1	303.6	———	293.6	———	300.9	———
11	308.1	+4.5	290.9	−2.7	297.2	−3.7
23	306.8	−1.3	298.1	+7.2	309.0	+11.8
September 1	302.7	−4.1	287.2	−10.9	307.2	−1.8
11	306.8	+4.1	281.8	−5.4	300.0	−7.2
21	308.1	+1.3	290.0	+8.2	297.7	−2.3
October 1	309.0	+0.9	293.2	+3.2	302.2	+4.5
11	309.0	———	285.4	−7.8	302.2	———
21	301.0	−8.0	286.3	+0.9	———	———
November 1	299.0	−2.0	288.3	+2.0	———	———
11	297.2	−1.8	290.0	+1.7	———	———
21	300.9	+3.7	290.9	+0.9	———	———
December 1	306.3	+5.4	294.5	+3.6	———	———
8	307.2	+0.9	297.3	+2.8	———	———
Gain or loss in weight		+3.6		+3.7		+1.3

DISCUSSION OF RESULTS

Palatability

To have a basis for determination of the relative palatability of grasses, the percentage of the total amount consumed was calculated for each grass.

TABLE 4

Showing the results of feeding trials

EXPER. NO.	DATE 1923	DURATION[a]	NO. OF ANIMALS	AVERAGE CONSUMPTION A DAY FOR ALL ANIMALS									
				Guinea		Napier		Cogon		Culape		Batadbatadan	
		days		*kgm.*	*per cent*	*kgm.*	*per cent*	*kgm.*	*per cent*	*kgm.*	*per cent*	*kgm.*	*per cent*
1	Aug. 2–18..	15	3	58	43.7	46.3	34.9	28.4	21.4	—	—	—	—
2	Aug. 19–Sept. 1...	14	3	—	—	83.1	66.5	41.8	33.5	—	—	—	—
3	Sept. 2–19	18	3	—	—	42.8[b]	38.5	68.5	61.5	—	—	—	—
4	Sept. 20–Oct. 9....	20	3	93.1	72.2	—	—	35.8	27.8	—	—	—	—
5	Oct. 11–16..	6	2	58.3	61.7	36.2	38.3	—	—	—	—	—	—
6	Oct. 18–Nov. 9...	22	2	59.6	65.4	—	—	—	—	31.5	34.6	—	—
7	Nov. 12–24.	13	2	—	—	—	—	—	—	46.9	52.5	42.5	47.5
8	Nov. 25–Dec. 7...	13	2	—	—	60.8	65.1	—	—	32.6	34.9	—	—

[a] The plan of duration for each experiment was thirty days, but owing to shortage of grasses the experiments had to be closed earlier.

[b] Napier grass in flower.

Experiment 1. The results of a fifteen-day test to determine the consumption of Napier grass, Guinea grass, and cogon grass are given in table 4. Examination of the data presented shows clearly that of the three grasses the greatest daily consumption was of Guinea grass. The results of the test show Guinea grass was more palatable than either Napier grass or cogon; and that cogon was the least palatable of the three. The calculated percentage consumed of each grass by the animals was as follows: Guinea grass, 43.7; Napier grass, 34.9; and cogon, 21.4.

Experiment 2. To further determine the relative consumption of Napier grass and cogon, experiment 2 was run. Table 4 clearly shows a decidedly greater consumption of Napier grass than of cogon. These results confirm those of experiment 1, in so far as these two forages are concerned, showing that Napier grass was more palatable than cogon. From the data presented, of 124.9 kilograms of forage consumed, the average daily consumption, 66.5 per cent was Napier grass and 33.5 per cent was cogon.

Experiment 3. Table 4 gives the results of a comparison between Napier grass when in flower and cogon. Cogon was the more relished by the animals under this condition. This was because at the flowering stage,

Napier grass is rough and hard, so the animals ate only the leaves, rejecting the rough, hard portions of the plants. The percentage consumption of each grass was: Napier grass, 38.5; cogon grass, 61.5.

Experiment 4. Table 4 gives the results of a test between Guinea grass and cogon. The figures show strikingly the marked preference of animals for Guinea grass rather than cogon. The results show that Guinea grass is more palatable than cogon. 72.2 per cent of the feed consumed was Guinea grass and 27.8 per cent was cogon.

Experiment 5. A comparison of Guinea grass and Napier grass shows that of an average daily consumption of 94.5 kilograms of feeds, 58.3 kilograms were Guinea grass and 36.2 kilograms were Napier grass. It will be noted that the average daily consumption of feeds was smaller than that in the previous experiments. This was because one of the animals was eliminated at the beginning of the experiment as the supply of feeds was not enough to last the animals the whole period of the experiment. The calculated percentage of each grass consumed follows: Guinea grass, 61.7, Napier grass, 38.3. The data presented are the results of a six-day experiment. The figures corroborate the results obtained in experiment 1, for Guinea grass and Napier. Findings at the Lamao Station of the Bureau of Agriculture (1924) show the same result; that is, Guinea grass is more palatable than Napier.

Experiment 6. Table 4 shows the amount of Guinea grass and culape, or carabao grass consumed by the animals. The results show that there was greater consumption of Guinea grass than culape. The percentage of each grass consumed by the animals is: Guinea grass, 65.4; culape grass, 34.6. This shows that Guinea grass is much more palatable than culape.

Experiment 7. The results of a thirteen-day test on the determination of the amount of culape and batadbatadan consumed by the animals show that these two feeds were similar in palatability. There were times when the amount of batadbatadan consumed was greater than that of culape. On the whole, however, the amount of culape consumed was greater than that of batadbatadan. The average daily consumption of each grass was: culape, 46.9 kilograms; batadbatadan, 42.5 kilograms. The calculated percentage consumed is: culape, 52.5; batadbatadan, 47.5. The table shows that culape is more palatable than batadbatadan by a narrow margin of 5 per cent. The difference however is too small to warrant the statement that one is better than the other.

Experiment 8. Table 4 shows the amount of Napier grass and culape consumed by the animals. The results show a decidedly greater consumption of Napier grass than of culape. The percentage of each grass consumed by the animals was: Napier grass, 65.1; culape, 34.9. The figures show that Napier grass is more palatable than culape.

No experiments were performed to establish the relative rank of cogon, batadbatadan, and culape, but judging from the results of experiments in which these grasses were compared with others, they will likely rank in this order: (1) cogon; (2) culape; and (3) batadbatadan.

Analysis of feeds

In order to determine the relative value of the different feeding stuffs given to animals, it is necessary that their chemical composition be compared.

TABLE 5

Showing analysis of the different forages studied

GRASSES	NO. OF SAMPLES	MOISTURE	FATS	ASH	PROTEIN	FIBERS	N.F.E.
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Napier grass.....	5	86.26	0.31	2.31	1.15	4.72	5.25
Guinea grass.....	4	76.97	0.57	4.09	2.71	7.08	8.58
Cogon grass.....	5	66.28	1.00	3.07	2.18	12.14	15.33
Culape grass.....	2	79.47	0.92	2.47	2.46	6.17	8.51
Batadbatadan.....	2	81.03	0.62	2.56	2.45	6.30	7.04

Table 5 shows the composition of the different forages treated in this paper, based on their average chemical compositions. The comparison is made on the following constituents: Moisture, crude fats, ash, crude proteins, crude fibers, and carbohydrates.

Moisture. The amount of moisture present in the different samples analyzed may be arranged according to the following order: Napier grass, 86.26; batadbatadan, 81.03; culape, 79.47; Guinea grass, 76.97; and cogon, 66.28.

Crude fats. The fat constituents of the different grasses arranged according to the percentages as found in the different samples are as follows: cogon, 1.00; culape, 0.92; batadbatadan, 0.62; Guinea grass, 0.57, and Napier grass, 0.31.

Ash. The ash constituents of the different samples range from 2.31 in Napier grass to 4.09 in Guinea grass. The percentages of ash as found in the samples studied are: Guinea grass, 4.09; cogon, 3.07; batadbatadan, 2.56; culape, 2.47; and Napier grass, 2.31.

Protein. Guinea grass gave the highest percentage of protein. Arranged in a descending order, the percentages given by the different samples analyzed, are: Guinea grass, 2.71; culape, 2.46; batadbatadan, 2.45; cogon, 2.18; and Napier grass, 1.15.

Crude fiber. The lowest percentage of crude fibers was found in Napier grass. The percentage found in the different samples arranged in a descending order are: cogon grass, 12.14; Guinea grass, 7.08; batadbatadan, 6.30; culape, 6.17; and Napier grass, 4.72.

Carbohydrates. The percentages of carbohydrates present in the different samples in the descending order are: cogon grass, 15.33; Guinea grass, 8.58; culape, 8.51; batadbatadan, 7.04; and Napier grass, 5.25.

SUMMARY AND CONCLUSIONS

From the results of these experiments on the palatability and chemical composition of different forages, the following conclusions may be drawn:

1. Guinea grass proved to be the most palatable of the grasses studied.
2. Napier grass is more palatable than either culape or cogon but less palatable than Guinea grass.
3. Cogon is less palatable than either Guinea grass or Napier grass.
4. Culape and batadbatadan are almost equal in palatability. Both are less palatable than either Guinea grass or Napier grass.
5. The relative abundance of the different components found in the different samples may be summarized as follows:

Guinea grass: (4) moisture; (4) fats; (1) ash; (1) protein; (2) crude fibers; (2) carbohydrates.

Napier grass: (1) moisture; (5) fats; (5) ash; (5) crude fibers; (5) carbohydrates.

Cogon: (5) moisture; (1) fats; (2) ash; (3) crude protein; (1) crude fibers; (1) carbohydrates.

Culape: (3) moisture; (2) fats; (4) ash; (2) crude protein; (4) crude fibers; (3) carbohydrates.

Batadbatadan: (2) moisture; (3) fats; (3) ash; (3) protein; (3) crude fibers; (4) carbohydrates.

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AN ABERRANT ROSAL (GARDENIA FLORIDA, L.) FLOWER OF SEMINAL ORIGIN[1]

JOSÉ M. CAPINPIN
Of the Department of Agronomy

WITH ONE PLATE

The specimen here described appears to be worth recording as an illustration of how extreme may be variability of seedling progeny. In a previous report[2] on rosal, its ornamental value was mentioned and the variability of the different seedling types was recorded. Of the seedlings then reported, Plant No. 54, because of some unique characteristics, was described. This same plant is the subject of the present report.

Plant No. 54 is one of the rosal seedlings which produced flowers radically different from any known rosal types. The whole green perianth structure is a set of multifarious bracts. There is no differentiation of the calyx and the corolla. The flower at the bud stage could hardly be distinguished from the leaf bud. (See plate.) In between the supposed sepals and petals is a set of leaf-like outgrowths. The flower is neuter with respect to sex, there being no indication of the presence of functional sexual parts. The characteristic qualities of the ordinary rosal flower are absent.

The variation is rather persistent, for despite the heavy pruning which the plant has undergone and the various cultural treatments the aberrant flowers continue to appear. From ten to fifteen flowers may be produced in each flowering season. This floral abnormality was observed in the consecutive flowering periods, August 30, 1924, June 30, 1925, and July 28, 1926. An interesting fact is that, so far, no other form of flowers except the aberrant has appeared on this particular seedling.

On close examination of the flowers, no indication was found of pathological cause or insect injury, that might account for this kind of floral deformity. Undoubtedly this extreme variation lessens the ornamental value of this seedling. Its appearance, however, is of interest because of the relationship of the floral parts with respect to their genetic origin and value. In the first place, it may be said that this phenomenon illustrates the appearance of an abrupt seminal variation or mutation under which this change may be classified. It is to be noted that the particular plant which produced this change is one of the seedling offspring of a natural hybrid parent. It is then probable that the phenomenon may be an effect of natural hybridism,

[1] Experiment Station contribution No. 415. Received for publication October 11, 1926.

[2] Capinpin, José M. 1925. A study of Mendelian inheritance in natural hybrids of rosal (Gardenia florida, L.). The Philippine Agriculturist **14**: 39–44. (*1 pl. and 1 text fig.*)

accompanied by both internal and external factors. While the plant is sexually sterile, the aberrant flowers may be assumed to be hereditary through vegetative generation. On the other hand, the aberrant flowers may be considered a manifestation of the foliar evolution through metaphanic variation, according to which the corolla and the calyx are modified or metamorphosed leaves. The presence of supernumerary leaf-like outgrowths may be taken as reversal structures pointing out an evolutionary change.

A—Typical flower of rosal.
B—The aberrant forms produced by Seedling No. 54.

PLATE I

ABSTRACT[1]

The relation of seedling vigor to production in rice. MANUEL F. ABAD. (*Thesis presented for graduation, 1925, from the College of Agriculture, No.* 243; *Experiment Station contribution, No.* 416.)—This experiment included two cultures, one was performed in the College of Agriculture, Los Baños, Laguna, during the dry season, and the other during the rainy season. Lowland varieties Apostol and Macan Peña were used. The seeds were planted by the *bacal* method. At the age of three weeks the seedlings were pulled up. Using the highest ligule of the leaves as a base mark, the plants were trimmed individually. To determine the vigor, each plant was weighed with the greatest accuracy. The two paddies used were in different places but were uniform in character. They were each divided into two equal rectangular lots, one of which was planted to Apostol and the other to Macan Peña. One thousand seedlings of each variety were transplanted singly in the paddies, allowing a twenty-centimeter distance each way. Each seedling bore its number and its weight. The field was kept clean and with sufficient moisture throughout the growing period. The number of tillers, the number of fruiting culms, the height of plants, the age at the flowering period, the age at maturity, the weight of panicles, the weight of straw, and the weight of the seedlings were recorded. From each variety at least one hundred plants that were free from insect pests and disease were pulled up at random. These were used in the experiment.

In the first culture 341 plants of the variety Apostol and 100 plants of variety Macan Peña were used. Seven pairs of characters were studied; weight of seedling and number of tillers per plant, weight of seedling and number of fruiting culms per plant, weight of seedling and height of plants, weight of seedling and number of days to flowering, weight of seedling and number of days to maturity, weight of seedling and weight of panicles, and weight of seedling and weight of straw.

In the second culture 200 plants of each variety were used in the study of the same seven pairs of characters that were used in the first culture.

The author found that there was no relation whatsoever between the weight of seedling and number of tillers per plant, weight of seedling and number of fruiting culms per plant, weight of seedling and height of plant, weight of seedling and number of days to flowering, weight of seedling and number of days to maturity, weight of seedling and weight of straw, in the two varieties studied. The coefficients of correlation of these characters of both varieties were slightly variable, the variability being slightly positive

[1] Abstract prepared as a part of the required work in English 6, College of Agriculture.

but not significant in the weight of the seedling and number of tillers per plant, weight of seedling and number of fruiting culms per plant, weight of the seedling and height of plant, and weight of seedling and weight of panicles of the variety Apostol, and the variability was slightly negative in the weight of seedling and number of days to flowering, and weight of seedlings and age at maturity. Of the variety Macan Peña, there was a slightly positive coefficient of correlation in the weight of seedling and number of tillers per plant, weight of seedling and number of fruiting culms per plant, weight of seedling and weight of panicles, and weight of seedling and weight of straw, but none was significant, while there was a slightly negative correlation in weight of seedlings and height of plants, weight of seedlings and age at the flowering period, and weight of seedlings and age at maturity.

In the second culture there was no decided correlation between the pairs of characters studied, because the coefficients of correlation were less than five-tenths with small probable errors. In the variety Apostol there were found marked correlations between the weight of seedling and number of tillers per plant, weight of seedling and weight of panicles, and weight of seedling and weight of straw; a slightly positive correlation between the weight of seedling and number of fruiting culms per plant, and weight of seedling and height of plant; and a slightly negative correlation between the weight of seedling and age at flowering, and weight of seedling and age at maturity. Of the variety Macan Peña there was marked correlation between the weight of seedling and number of tillers per plant, weight of seedlings and number of fruiting culms per plant, and weight of seedling and weight of panicles; slightly positive between the weight of seedling and height of plant, and weight of seedling and weight of straw; and slightly negative between the weight of seedling and age at flowering, and weight of seedling and number of days to maturity.

The author found from the two cultures used that the coefficients of correlation are influenced by the planting season of rice, the rainy season being better than the dry season.

Farmers in the Philippines believe that vigorous seedlings give higher production than non-vigorous seedlings. According to the author's results this is not generally true.

—*Abstract by José Diaz Bagarino.*

Don't wait for great opportunities. Seize common, everyday ones and make them great.

EXCHANGE NOTES

In spite of the handicap of lack of time, the individual farmer should resolve to become more familiar with the marketing side of his business. He should actively try to develop a background of knowledge and understanding of where his produce is sold, how it is used, the potentialities and limitations of the market, much as a manufacturer would endeavor to know the market for his product. No matter what our work is, if we are to progress we must constantly broaden our information, and "get understanding."

—*The Prairie Farmer* (Illinois)

Forty per cent of the bulk of a fertile soil should be air and not stagnant water. Oxygen in the soil is necessary for the establishment and maintenance of the highest-class plants that a soil will carry. Drainage provides oxygen to water-ridden soils.

—*Journal of Agriculture* (New Zealand)

According to a writer in the "Quarterly Bulletin" of the Michigan Agricultural Experiment Station, the disease known as bacillary white diatthos is probably the cause of greater losses and more discouragement to poultry-raisers and hatchery-men than any other poultry disease.

By far the greatest losses from this disease occur among young chicks from four to sixteen days old. The disease may, however, prove fatal at any age, and infected chicks which survive seldom succeed in freeing themselves from infection, but remain carriers of the disease as long as they live. It has been found that the yolks of eggs laid by infected hens frequently contain the organism which produces bacillary which causes diarrhoea. Chicks hatched from such eggs have the disease when hatched and usually die within three or four days.

Various remedies have been suggested at different times, but at present it is generally understood that there is no therapeutic treatment for the disease that has much practical value. The disease may, however, be eliminated from a flock of poultry by applying the macroscopic agglutination test to all birds in the flock before the eggs are saved for hatching purposes. It is very important to remove all positively reacting birds as soon as possible after the test is made, because it is very likely that infection will spread among mature birds as well as young stock, and though visible symptoms are rare in adult birds, such birds may become carriers of the disease.

* * * * * * * * * * * * *

The death of young chicks is by far the greatest loss caused by the disease, but loss is also caused by reduced egg production. This was demonstrated in an experiment made at Michegan, which showed that, while healthy hens laid about 166 eggs in the year, infected hens produced only 136. This meant a loss of 30 eggs for every infected hen, or about 9 cents per hen of the entire flock per annum.

Department of Lands and Agricultural Journal, (Ireland)

Farm economic conditions should be improved so that the boys and girls who love the farm and want to stay there can reasonably hope to live as well as their friends who go to the city. Conditions that discriminate against the farm and in favor of the city must be changed. There is much ground for hope that this will be brought about. Intelligent farm leadership is making progress in that direction. It is being aided by the broader-minded business men.

—*The Prairie Farmer* (Illinois)

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur, or Bordeaux paste.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

—*Agricultural Journal* (Queensland)

Seventy-five farms in Carroll, Cass, Howard and Miami counties, Indiana, raising 1,540 acres of soybeans, obtained an average yield of 16.3 bushels per acre when the seed was planted in rows. On twenty-eight farms growing 440 bushels the yield was 13.6 bushels when the beans were sowed broadcast.

—*Successful Farming* (Iowa)

COLLEGE AND ALUMNI NOTES

H. H. Bartlett, Professor of Botany in the University of Michigan, accompanied by Dean Kalaw of College of Liberal Arts, U. P., and Professor José K. Santos, Acting Head of Botany Department of same college, were Campus visitors recently. Professor Bartlett has been engaged in botanical research in Formosa for some months. He will return to the United States by way of Europe.

Dr. K. Dammermann, Director of the Zoological Museum for Netherlands East Indies, located at Buitenzorg, Java, spent some ten days at the College in December. Doctor Dammermann is gathering additional material for a second edition of his well-known book on animal pests.

Stories from Japanese History by Emma S. Yule, Head of the Department of English, made its appearance in December. The book, which was written for boys and girls but is not without interest for adults who are not very familiar with Japan's past, tells through tales and sketches not the history of Japan so much, as it reveals the spirit and characteristics of the people. To give the background, a historical sketch is included. The book which contains about three hundred pages is well illustrated and in print and binding is a credit to the publishers, D. C. Heath and Company.

A comment on the Third Pan-Pacific Science Congress by Doctor Gonzalez, the University delegate, which was written at the request of *The Yuben*, a Japanese periodical, appears in the November issue of that popular magazine. A half-tone showing our Animal Husbandry Head as a stern and solemn man accompanies the note. The comment, the delegate says, and as it appears in ideographs, we must take his word, tells in a general way what problems relating to the welfare and advance of man were discussed by the congress.

The Chemistry Department has just learned that Prof. F. T. Adriano who is taking post-graduate work in analytical chemistry at Cornell University, has passed the final oral examination required for the degree of Doctor of Philosophy. Professor Adriano went to Cornell in August, 1925, as a travelling fellow of the University of the Philippines.

Dr. Eduardo Quisumbing writes that he has been appointed Research Associate of Botany of the University of California at Berkeley.

The wide-spread interest in "The New College Copra Drier" is indicated by the following letter from one of the largest coconut plantations in the Far East:

DINDINGS COCONUT ESTATE
(Selama–Dindings Plantations, Ltd.)

Taiping, Perak, F.M.S.
24th November, 1926.

PROFESSOR MANUEL L. ROXAS,
Head, Dept. of Agricultural Chemistry,
College of Agriculture,
Los Baños, Laguna, P. I.

DEAR SIR,

I wish to thank you very cordially for the most interesting Circular No. 11, "The New College Copra Drier," which reached me by this morning's mail. I have not had time to study the particulars of the Drier, but from a preliminary reading it certainly appears that the device is what I have sought for years. I very much appreciate your kindness in giving me the information.

Believe me, dear sir,
Yours very truly,

A. C. JAMESON,
Manager, Dindings Coconut Estate.

That we are not without honor in our own country these words in a letter to the Dean from Mr. Joaquin M. Abelo of Binalbagan, Occidental Negros, testify: "The new copra drier invented by the two members of the department of agricultural chemistry is far-reaching in its effect in the way of promoting the copra industry among our people.

"Copra producers speak about it. Newspapers publish its advantages * * *."

Dr. Miguel Manresa, who is doing graduate work at the University of Wisconsin, writes most interestingly in a letter to Doctor Gonzalez of his work and broader interests. A few extracts follow:

Philosophy and contagious abortion in cattle are the two big things on the campus this year. The former has arisen in view of the presence of a German Professor, Dr. Driesch who is here with us as exchange professor this semester. As you may already know Professor Driesch is a big figure in the theory of vitalism. He is giving a course in the philosophy of the organism which is being attended by hundreds of students of biology.

In line with the so-called Wisconsin open-mindedness, Professor Guyer has conducted a seminar in order that the other side of the question may be presented. (Mechanistic theory.) Dr. Guyer's seminar is equally well attended not only by students but outsiders as well. It may interest you to know that Driesch has a number of auditors from the clergy class.

During the last two months the talk around the campus has centered on the mechanistic and vitalistic conception. Professor Driesch has already held two public conferences and in one of these conferences he has crossed swords with other intellects in psychology and biology. Both conferences have been well attended by University men and outsiders as

well. Driesch is a clear thinker and although he is speaking in a foreign tongue (English) he has shown no handicap of it at all. His presentation of the subject is masterly. I do not wish to be understood as saying that I am in sympathy with the vitalistic view, however.

I find that I have to modify my previous statement relative to the amount of money that has been donated to the Agricultural College for Professor Hart's abortion Experiment. The correct amount is $50,000 as you will see in the enclosed program which featured the donation ceremony. In donating said amount the Wisconsin Farmers' Association, through its President said that should additional funds be needed the association will do all it can to make it available.

At this writing my experiments have already taken the form of a real problem. I find that I have had to devote a great deal of overtime on the problem every day. Sundays and holidays included * * * I find that our caretaker cannot give them (the rabbits) the care that they should receive due to the growing population of the rabbits. And since the success of the problem depends very largely on the success of raising these animals, I am determined to do all that I can to raise them!

I have a bit of news for Miss Yule. Dr. Cole received a copy of her book on the Preparation of Mss. and in our Genetic Seminary last week Dr. Cole said that before accepting graduate theses he will require students to consult Miss Yule's and Professor Trelease's book quite freely.

The College of Agriculture Alumni Association in its semi-annual meeting held in Manila on November 14, 1926, reaffirmed its stand to push the construction of an Alumni Hall on the Campus of the College of Agriculture. Dr. Toribio Vibar '12 was appointed campaign manager. Pledge blanks are being sent to all the four hundred alumni. Twenty Thousand Pesos is the goal of the campaign. Each alumnus is urged to pledge at least Fifty Pesos to be paid during the next two years. The following pledges have been received already:

1.	José Zamora, '11	₱ 200.00
2.	Inocencio Elayda, '16	100.00
3.	José Camus, '14	100.00
4.	Toribio Vibar, '12	100.00
5.	Santiago Festin, '18	50.00
6.	Emiliano Roldan, '19	50.00
7.	Gaudencio Reyes, '20	25.00
8.	Eulogio Rodriguez, '25	25.00
9.	Basilio Hernandez, '22	20.00
10.	Vicente Aldaba, '15	25.00
11.	Zosimo Montemayor, '24	40.00
12.	Victor Sulit, '19	25.00
13.	Marcelino Constantino, '16	50.00
14.	Ananiano Elayda, '20	20.00
15.	Feliciano M. Clara, '20	25.00
16.	Mariano Villaraza, '20	50.00
17.	Gil Opiana, '23	25.00
18.	Amando Laparan, '14	20.00
19.	Calixto Zamuco, '23	40.00
20.	Daniel Peña, '22	50.00
21.	Vicente Bartolome, '13	50.00
22.	Eladio Zablan, '14	50.00
23.	José Q. Dacanay, '15	50.00

24.	Exequiel Alcasid, '19	25.00
25.	Valente Villegas, '13	35.00
26.	Roman G. Tomaneng, '20	50.00
27.	Francisco O. Santos, '19	50.00
28.	Eliseo T. Gomez, '25	50.00
29.	Severo Marquez, '21	50.00
30.	Juan B. Cabanos, '19	50.00
31.	Francisco D. Marquez, '15	50.00
32.	Nemesio Catalan, '20	50.00
33.	Manuel L. Roxas, '11	200.00
34.	Juan Unite, '21	50.00
35.	Getulio A. Guanzon, '25	50.00
36.	José B. Juliano, '23	50.00
37.	Macario A. Palo, '24	25.00
38.	Roman P. Estioko, '22	25.00
	Total as of Dec. 10, 1926	₱2,000.00

Revised list of pledges will be published from time to time in this journal.

New books and other publications added to the Library, College of Agriculture, from September 30 to December 1, 1926

Bloomfield, D., et al.
Financial and executives for employees, Vols. 1 and 2. 1923.

Bloomfield, D., et al.
Problems in personal management. 1923.

Cooper, E.
My Lady of the Chinese courtyard. 1914.

Drinkwater, John
The outline of Literature, Vols. 1–3. 1923.

Edminster, L. R.
The cattle industry and the tariff. 1926.

Graham, W. A.
Siam, Vols. 1 and 2. 1924.

Gray, A.
Structural botany. 1879.

Marsden, O. S.
Character, the grandest thing in the world. 1899.

Mayo Foundation
Lectures on nutrition. 1925.

Miln, L. J.
In a Shantung garden. 1924.

Percival, A. B.
A game rangers note book. 1924.

Reichert, E. T.
The differentiation and specificity of starches in relation to genera species, etc. Parts 1 and 2. 1913.

Thomas, L.
Beyond Khyber pass. 1925.

SOME SUGGESTIONS ON HOW TO LIVE LONG[1]

Here are some recipes for old age deferred. I thought some of you would be glad to have them.

First: Select your ancestors. This is the best one. I am sorry is not more practicable. You are in for it personally and can't help yourself, but you may help your descendants tremendously by mating only into long-lived families. Especially, keep out of families with a history of tuberculosis and cancer. A good inheritance is certainly an immense factor in longevity, probably the greatest single factor * * *

Second: Avoid excesses. This recipe is practicable but more or less difficult, depending on the nature of one's inheritance and on his environment, that is, on his temptations. A fine ambition, hard work, and a pure love are strong safeguards. Good books and good company are other protections. Religion is another. Pitch will stick to whomsoever handles it. "Have no friends not equal to yourself," said the wise Confucius. He also said, "If a man will be virtuous one day, I have not known his strength to fail him," and by this he meant that we have to live and strive against the ape and the tiger in us *only one day at a time!*

Third: Keep cheerful, that is, don't worry. Worry kills more than work * * * Be generous, and sociable, and altruistic, as well as cheerful, and these sentiments will react upon you and make you more cheerful. I have been accused of being proud and unsociable. It is not true! Say rather: "He is shy and absorbed, and the days are not long enough!" Be of a forgiving spirit. Most of my life has been spent delving into the printed history of things, isolating or inoculating parasites, looking into culture tubes and flasks, or staring down the barrel of a microscope. It is a very laborious and exacting and at the same time a rather narrowing occupation, albeit a fascinating one. I have often said, jokingly, I would have gone into some other business if I had realized how much hard work I would have to do to get a *little* out of plant pathology.

Fourth: Cultivate the intellectual life. I believe that exercise of the intellect is an aid to longevity. How many philanthropists, statesmen, mathematicians, astronomers, physicists, chemists, geologists, physicians, and students of literature and the natural sciences have lived to be old. Their name is legion * * *

[1] Extracts from address by Dr. Erwin F. Smith, U. S. Dept. Agric., delivered at annual dinner of the Botanical Society of Washington, March 4, 1924.

Fifth: Do not neglect the physical side. Breathe pure air, night and day; eat a good variety of plain foods and not too much. Don't worry about calories and vitamins. Do some physical work each day. Golf is for rich men; sawing wood, tending furnace, hoeing in the garden, housework, and botanizing are better exercises for such as we are. Botanizing is a more wholesome exercise than straight walking, because, like golf, it brings more muscles into action, and at the same time keeps the mind interested. But straight walking is also good. How soon it dissipates a thousand gloomy fancies! Five or ten miles a day ought to keep any scientific man in trim, unless he is a glutton, in which case there is no hope for him, here or hereafter, according to Dante. You remember how low down in his *Inferno* he puts them.

Sixth: Here are some of my own habits. My first acquaintance with Dr. Osler, then a great light in the medical firmament, was made just 30 years ago * * * Osler told me he worked like the devil nine months of the year but played the other three. I have not done that, but I have taken plenty of mental recreation, if not physical. I have learned it is not good to be jabbing forever on one set of brain cells. By spurts, a few months at a time, I have worked at certain subjects very hard, often 12 to 16 hours a day or more, *i. e.*, all day and half the night, but always I have gone easily afterward for a while to recuperate, and one year with another, I have done a great deal of miscellaneous reading not directly related to my work—religious books (bibles, sermons, books of devotion, Christian, Stoic, Buddhist, Mohammedan); current literature; travels; histories, memoirs; autobiographies; letters; essays (Bacon, Montaigne, Carlyle, Emerson, and many others); poems (all sorts in half a dozen languages); plays (especially Shakespare, but a little of Ibsen and Shaw,—yes, even Shaw—also Schiller, Hugo, Racine, and Molière—I have been very fond of Molière and of Synge, the Irish playwright); ghost stories; detective stories; novels and romances (Smollet, Fielding, Scott, Dickens, Thackeray, Hardy, Dumas, Hugo, Daudet, Cooper, Hawthorne, and many others); politics; logic; philosophy (Plato, Kant, Spinoza, Schopenhauer, Comte, Herbert Spencer, William James); Greek, Roman, and Indian mythology; Egyptology; folk-lore; art criticism; general botany; entomology; archaeology; geology; astronomy; chemistry; medicine; and what not. All has been grist to my mill, with the exception of the higher mathematics, in which I have had no training. All knowledge has fascinated me. Like Browning's Grammarian, I would know all; even to the crumbs, I would eat up the feast. I read all of the 50-odd volumes of *Botanisches Centralblatt* one year. Beginning with the first article, I read all the *Atlantic Monthly* for many years, not to mention a dozen other journals. And, it is safe to say, I have read one thing nobody else in this room has read, that is, the whole of the letter C in the *Century Dictionary*, only a matter of 800 pages. This I did to get their style of writing definitions before I began my work on Mycology for the first edition

of the *Standard Dictionary*. I did it in four days and my head was in a whirl when I got through. I was never intoxicated with alcohol, but this *was a kind of intellectual drunk*, not to be commended.

The brain is a curious organ; no two subjects, I believe, bring into play quite the same set of brain cells, and by shifting interests the hard-worked cells of your specialty will have a chance to rest, otherwise, you will get neurasthenia, and especially if you worry. I have some reason to believe that the sub-division of labor in the brain is even greater than I have indicated, that is, that each language you learn involves a new set of cells and even that the past or future tense of a language does not exercise quite the same cells as the present tense. But enough of this.

Seventh: Finally, I am two persons in one, many persons in one, if I regard my ancestors. When I am sick I am a pessimist; when I am well, and that is generally, I am an optimist, and my optimism has grown upon me with advancing years until it is now perhaps a besetting sin, but I am pretty certain to die a pessimist, and that may compensate. Pessimism is due generally to bad digestion and to undue reflection on present miseries—a bad stomach is always an evil influence. Blessed is the man who can eat hard boiled eggs at midnight and sleep the sleep of the just. Yet the chances are he will not live out his span of life because some time he will presume *too much* upon his immunity. Optimism means good health, which should be the normal state of man, and still more it means altruism as opposed to egoism, and also, and especially, it means altruism as opposed to egoism, and also, and especially, it means *a far-reaching outlook*, and faith in God and in the perfectibility of humanity. In an optimistic mood I wrote the following sonnet, with which I will close. It embodies the best of my philosophy of life. In it I have blended both my pessimism and my optimism, but optimism has the final word.

AT 70

Backward I look from summit of the years
At the rugged dusty way of toil and grime,
From level distant plain of boyhood's prime,
—Way strewn with hopes, with triumphs and with tears:
And I am optimist, like him who hears
Clear voices call from higher peaks of Time's shore,
Driven by wind and waters evermore!
And *millions* make but shifting dunes and bars!
Yet I can read in every grassy sod
Divine great thoughts that sweep beyond the stars
And make me one with Him who is our God!

HE DUG

He wanted a job and, like every one else,
He wanted a good one, you know;
Where his clothes would not soil and his hands would keep clean,
And the salary mustn't be low.
He asked for a pen, but they gave him a spade,
And he half turned away with a shrug,
But he altered his mind and, seizing the spade—he dug!

He worked with a will that is bound to succeed,
And the months and the years went along.
The way it was rough and the labor was hard,
But his heart he kept filled with a song.
Some jeered him and sneered at the task, but he plugged
Just as hard as he ever could plug;
Their words never seemed to disturb him a bit—as he dug.

The day came at last when they called for the spade
And gave him a pen in its place.
The joy of achievement was sweet to his taste
And victory shone on his face.
We can't always get what we hope for at first,
Success cuts many queer jigs,
But one thing is sure—a man will succeed—if he digs.

LOUIS E. THAYER

There is dry rice and water-grown rice; rice of the hills and rice of the plains. The Chinese call it "white jade beads," and say that it "benefits the breath, removes anxiety and thirst, warms the viscera, harmonizes the gases of the stomach, and causes the growth of flesh!" The thin rice-water gruel with which they break their fast each morning, is considered to "benefit the vital principle, strengthen the will, clarify the hearing and brighten the eye."—FLORENCE AYSCOUNGH. *A Chinese Mirror.*

EDUCATION AND AGRICULTURAL PROMOTION IN JAPAN: II. JAPAN'S SYSTEM OF EDUCATION[1]

B. M. GONZALEZ

Delegate from the University of the Philippines and the Government of the Philippine Islands to the Third Pan-Pacific Science Congress

INTRODUCTION

Japan's educational revival dates only fifty-eight years back, when an educational officer was appointed in 1868 and various government schools were opened. In 1821 the Department of Education was established for the control of the educational affairs of the country.[2]

The department is to a large extent responsible for the present high position of Japan in the educational world. It is almost incredible that such great advance has been accomplished in so short a time, but Japan had a good foundation upon which to build a system of education when circumstances forced it to adopt Western ideas. A brief summary of the educational history of Japan before the Restoration may not be out of place in order that a proper perspective of the educational progress in Japan may be gained.[3]

Historical

In the year 184 Chinese classics were first introduced, and in 285, scholars from Korea first came to Japan. From 607 to 900, Japan sent students regularly to China who brought back Chinese culture and civilization. From 700 to 770, the Nara Period, there was considerable interest in art and in the vernacular literature. Many books were published, among which were a number by women authors and poets. In 809 the Japanese alphabet or syllabification was invented. This was derived from simplified Chinese characters. From 1192 to 1858 marks the Feudal Period in which the military people, the *shoguns* and the *daimios*, held the stage. In this age, literature was relegated to a position secondary to martial arts and held as fit only for priests, courtiers, and other non-military classes. The centuries from 1600 to 1858 marked the Tokugawa shogunate. There was a partial revival of interest in literature and arts in this period, principally among

[1] General contribution from the College of Agriculture No. 181.

[2] The Department of Education. 1926. A general survey of education in Japan. Tokyo.

[3] The data contained in this article were obtained mainly from publications of the Department of Education, catalogues of the Imperial Universities and the Japan Year Book, supplemented with information obtained directly from members of the staffs of the above entities for the use of which full acknowledgment is hereby made.

the men. In 1853, Commodore Perry of the United States Navy opened Japan to Western influence, and in 1872 the famous Imperial Rescript on education which stated that "henceforward education shall be diffused that there may not be a village with an ignorant family nor a family with an ignorant member" was proclaimed. In this same year the French system of dividing the country into educational areas, each with a university and a corresponding larger number of lower institutions, was adopted. The adoption of this elaborate system proved rather premature, and it was modified so that in 1879, with the employment of an American educator as technical adviser to the Department of Education, American ideas were introduced; these can be discerned readily by one familiar with the American educational system.

With such an educational background it is not so surprising that Japan has progressed very rapidly. Considerable honor accrues, nevertheless, to the wise statesmen of Japan who had the breadth of mind to accept knowledge no matter where it came from, and for their wonderful ability in adapting it to the needs of the country. The edict was to seek knowledge everywhere and from anybody and Japan practices it to this day whenever it wishes to embark on any new work for which local talent is lacking.

ELEMENTARY EDUCATION

Elementary education is compulsory in Japan in the sense that all children from six to fourteen years old who have not completed the course are required to attend school. The elementary course is of six years duration, and the period of compulsory attendance is also six years.

This compulsion works no particular hardship on the people and no complaints are heard on its account, as a matter of fact, there is a widespread feeling that the period of compulsion should be extended to eight years. The system is so effective that for the last ten years the rate of attendance has been maintained above 98 per cent, and the last few years, above 99 per cent of children of school age.

The elementary schools are widespread and are financed mainly by the cities, towns, and villages. In 1923 there were 25,373 elementary schools, thus allowing 2.8 schools to every 1000 children of school age.

The ordinary elementary schools of Japan may be considered as the equivalent of the Philippine elementary schools including primary and intermediate grades. The Philippine schools are of seven years duration instead of six, however.

There are also higher elementary schools in Japan, courses with which we have nothing in the Philippines to correspond. This course extends from two to three years beyond the ordinary elementary. These schools are really "side sprigs" of the general educational scheme in the sense that students going on for further education do not have to go through a higher

elementary school. They serve a very useful purpose, however, in extending school facilities beyond the ordinary primary grades to a large share of the population which would otherwise call its education at an end upon finishing the usual primary grades. In addition to cultural subjects one or more vocational subjects, as manual training, agriculture, commerce, domestic science, and sometimes drawing and a foreign language are taught in the higher elementary schools.

SECONDARY EDUCATION

Japanese schools are as a rule co-educational in the elementary grades, only. In the secondary grades we see a frank division based not so much on the old idea of keeping the sexes separate but rather on the Japanese idea that woman requires a different type of education than man. The boys go from the elementary school to the middle school, which is simply an intermediate step in their long period of schooling, while the girls go to girls' high schools which are cultural and vocational in character and aim to round up and finish their education, preparing them usually for the duties of home making.

Middle Schools aim to give secondary education to boys. The course extends for five years and takes up such subjects as Japanese, Chinese classics, one foreign language (English, German, or French), history, geography, mathematics, natural history, physics and chemistry, law and economics, industry, sewing, drawing, and gymnastics. Its equivalent in the Philippine system is the high school, but is one year longer. Combining the Japanese elementary school of six years and the middle school of five years gives a duration of eleven years, which is exactly equivalent to the combined four year primary, three year intermediate, and four year school courses of the Philippines.

Boys graduating from elementary schools are theoretically eligible to enter a middle school, but in practice, due to the large number of applicants, competitive entrance examinations are held and only about 10 per cent of qualified applicants are admitted. In this one rigid selective step may be found one of the basic reasons for the high standard of Japanese higher education in government schools. There were 500 middle schools in 1925, or one to every 50 elementary schools.

In addition to the middle schools for boys and the girls' high schools, other organs of secondary education are technical schools and technical continuation schools. Both admit students who have passed the elementary courses. The technical schools correspond to our trade and agricultural schools of high school grade, and the continuation schools to night trade or occupational schools. The continuation schools take in as students boys and girls engaged in regular vocations. The technical schools are rather varied in character and may be trade, commercial, agricultural, or nautical.

COLLEGIATE EDUCATION

This type of education is represented by the high schools of which there are twenty-five government supported. In addition, twenty-five state and private universities have preparatory schools of the same rank as the high schools.

While the original object of the high schools was to complete men's general education, at present they function almost exclusively as preparatory schools for students desiring to enter a university. The course is of three years duration and two curricula are followed, one preparing for a literary career and the other for the sciences. In addition to such general cultural subjects as history, economics, Japanese and Chinese, and natural sciences, the study of two foreign languages (English and German, or French) is made obligatory.

There is sufficient accommodation for only one-tenth the number of students in the middle schools in the high schools, so again a rigid selection becomes operative in the students who are able to enter the high schools. Theoretically, a graduate of a middle school may enter a high school on the strength of his diploma, but in practice an examination is instituted that sifts out only the best students. There is no disqualification in these examinations, and a persistent scholar may take them again and again until he qualifies. It is estimated that only about 20 per cent of applicants for admission in high schools can be accommodated every year.

The high school as found in Japan finds its counterpart in the junior college of America and the preparatory courses given to prospective students of the Colleges of Medicine and Law of the University of the Philippines. In Japan, however, this preparatory course is required not only in medicine and law, but also in all other cultural and professional courses as literature, science, economics, agriculture, engineering, veterinary, forestry, pharmacy, dentistry, etc., thus placing all learned careers on the same basis of preparation.

UNIVERSITY EDUCATION

In Japan, university education may be classed as distinct from college education in that it is clearly superior to it. Our conception of a university is that it is a group of associated colleges. In Japan it represents a definite educational standard rather than an organization, and so we may find single specialized institutions of high grade bearing the name university; for example, there is the Osaka University of Medicine, Tokyo Agricultural University, Tokyo University of Commerce, etc. The university closely corresponds to the American senior college with stiff junior college requirements for admission.

To avoid confusion with the usual meaning attached to the word college as a department of learning in a university, the word faculty has been adopted, thus they have in a university the faculties of law, of medicine,

of agriculture, etc., as the case may be, to correspond with the college of law, medicine, or agriculture in American universities.

The professional courses in the university itself are of three years duration, except medicine which is four. At the end of the course and after passing an examination the student is granted the degree *Gakushi* in the branch of learning wherein he specialized. This degree closely corresponds with the Master's degree in America. Eleven such degrees are conferred and a prefix is used to denote the particular title granted: as, Science—*Ri*gakushi, Medicine—*I*gakushi, Engineering— *Ko*gakushi, Law—*Ho*gakushi, for Economics and Commerce—*Keizai*gakushi, Philosophy, Arts and Letters—*Bun*gakushi, Pharmacy—*Yaku*gakushi, Agriculture—*No*gakushi, Forestry —*Rin*gakushi, and Veterinary—*Jui*gakushi.

POST-GRADUATE EDUCATION

All universities in good standing are authorized to grant the degree *Hakushi*, corresponding to the European doctorate degree, to those students who have devoted at least two years of study in the graduate school and have presented a thesis satisfactory to the University Council. Few or no courses are given to graduate students so that the whole time is practically devoted to research. Partially employed students may take four or five years to attain the same degree. The degree conferred bears the specialty in a manner similar to the Master's. For example, for Doctor of Agriculture it is *No*gaku-Hakushi, Doctor of Science *Ri*gaku-Hakushi, Doctor of Medicine *I*gaku-Hakushi, etc.

The graduate school is called *Daigaku-In* or translated literally, University Hall.

The examinations for the *gakushi* and *hakushi* degrees are for qualification or disqualification.

The bachelor's degree is normally not granted in Japan. There is provision however for high schools to carry a post-graduate course of one year beyond its normal scope of three years and to such students as graduate from this the degree of *Tokugyoshi* (Bachelor) is given.

THE EDUCATION OF WOMEN

Mention was made of the fact that government provision for the education of women ends with the girls' high schools, and that these are to a large extent vocational in character and in standards comparable to the boys' middle schools. The demand for higher education among girls, however, is so great that some girls' high schools give post-graduate courses of two to three years duration. The standard of these courses is almost comparable to that of the boys' high schools. Certain technical schools and continuation technical schools are also open to girls.

While it is still the universal feeling that the sphere of woman does not demand intensive education as preparation, yet the lack of provision

for the higher education of women is to a large extent due to economic stringency. Educators are frank to admit that government provision is not even sufficient for boys, and if girls were taken in it would mean the further exclusion of a corresponding number of boys.

Private girls' schools of higher grade exist in Tokyo, Kyoto, and other large cities and Women's Higher Normal Schools are found in Tokyo and Nara. There is also the Women's University in Tokyo.

The two younger Imperial Universities, Tohoku and Kyushu, admit women with adequate preparation as special students. A few are taking advantage of this opportunity.

THE EDUCATION OF TEACHERS

The training of teachers for the different grades of schools occupies an important place in the Japanese educational system. For example, each prefecture conducts a normal school for the training of elementary school teachers, while the Imperial government undertakes the training of teachers for the normal schools, middle schools, high schools, technical schools, etc. For high grade teachers, scholarships are granted tenable in the universities and higher normal schools. Students with adequate preparation are sent abroad for study in Europe and America along specialized lines of work.

OTHER SCHOOLS

Finally, brief mention should be made of kindergarten schools, schools for deaf and blind, and correctional institutes. In 1923 there were 747 kindergartens and 78 schools for deaf and dumb and blind.

PHYSICAL EDUCATION

With the advent of Western civilization the love for sports has been greatly stimulated in Japan. Military training is still the most important physical activity of schools. It is compulsory throughout the five years of the middle school course. Other sports of old Japan such as *judo*, or *jiujitsu*, wrestling, fencing, and archery have still many ardent followers, and are practiced considerably in secondary schools, but enthusiasm in them noticeably declines with the inroad of Western games. Baseball, which was first introduced in 1876 by American teachers at the Sapporo Agricultural College, now the Hokkaido Imperial University, is the most popular school game now and is played from the elementary schools to the universities. Other group games, such as football, basket ball, volley ball, track and field athletics are played widely and enthusiastically. Tennis has gone beyond the schools, and is played very widely by various institutions and clubs, athletic and otherwise, for recreation and exercise.

Athletics among girls is still in its inception. While each year marks an advance, yet the conservatism of the parents on this point makes progress slow. In girls' high schools a certain amount of physical education is required in the form of calisthenics, fancy steps, and figure movements.

THE FINANCING OF EDUCATION

The whole system of Japanese education has grown from the top down in the sense that it is the government that decrees the spread and growth of education, rather than the system's being the result of the evolution of the people demanding greater educational facilities, as is most typically exemplified by England. Therefore the financing of education is largely borne by the government,. Contributions by private individuals and entities, while considerable, form a small percentage of the total expenditure.

In 1925 the central government spent as follows for education:

	Yen
Elementary Education	42,333,000
Secondary Education	1,400,000
Higher Education	55,994,000
Normal Education	6,656,000
Other Education	194,000
Other Expenditures	6,190,000
Total	112,767,000

An estimate of the expenditures for 1924 by local public bodies—the prefectures, cities, towns, and villages—amounts to 356,439,000 Yen.

No figures are available on the amount of private money spent on education.

The finances of government schools are kept apart from the general funds of the government. Any surplus left over from the schools' yearly appropriations goes to swell the school funds; likewise any donations or income derived from fees, sale of products, used equipment, etc. Schools are encouraged to raise endowment funds to swell their finances.

No fees are usually charged in the elementary grades. In the higher schools tuition varies; the highest, 100 yen a year, being in the Imperial Universities.

The salaries paid Japanese teachers are on the whole lower than those paid in the Philippines for equivalent service and training. This is so, largely because the cost of living in Japan was, until comparatively recent years, rather low. Furthermore, Japanese teachers hold on to traditions of the old samurai who considered themselves as above pecuniary consideration. They have, however, in addition another compensation in the form of honors, medals, and decorations for meritorious and long service.

Teachers from the elementary grades to the university, and in common with other public servants above a certain grade, are also eligible to pensions. This amounts to one third of the retiring salary after at least fifteen years of service. For every year thereafter and up to a maximum of forty years 1/150 of the salary is added. This places the maximum pension at 50 per cent of the salary at the time of retirement. The participants contribute monthly one per cent of their salary to the pension funds.

SCLEROTIUM DISEASE OF TOMATO AND PEPPER[1]

MAXIMINO ATIENZA

WITH TWO PLATES AND ONE TEXT FIGURE

THE DISEASE

Hosts, geographical distribution, and economic importance

The *Sclerotium rolfsii* Sacc. reported by Ocfemia (1924) as causing fruit rot of tomato (*Lycopersicum esculentum* Mill.) and pepper (*Capsicum annuum* L.) is a common soil-inhabiting facultative parasite in Los Baños, Laguna, Philippine Islands. During the rainy season this fungus causes damping-off of seedlings, wilt, blight of shoots, and rots of fruits, stems, and roots of plants. *Sclerotium rolfsii* is destructive on plants which have the tendency to form a thick mat of interlacing stems and leaves over the ground. The *Sclerotium* fruit rot of tomato and pepper is common when the branches and fruits of these plants are very close to or touching the soil.

According to Stevens (1913) *Sclerotium rolfsii* Sacc. attacks a great number of plants in the southern United States. Tisdale (1921) states that *Scl. rolfsii* does great damage to germinating rice in Louisiana in the southern United States. He also states that the fungus attacks wheat (*Triticum vulgare*) and soybeans (*Glycine hispida* Maxim.) (*Glycine max* (L.) Merr.). Edson and Shapovalov (1923) report that *Sclerotium rolfsii* causes seed-piece rot, damping-off, stem rot, wilt, and blight of the Irish potato (*Solanum tuberosum* L.) in the United States.

Reinking (1918) reports that *Sclerotium* causes damping-off of seedlings and stem and root rots of peanut (*Arachis hypogaea* L.), coffee (*Coffea* spp.), gabi (*Colocasia antiquorum* Schott), soybean, sweet potato (*Ipomoea batatas* (L.) Poir), and yautia (*Xanthosoma sagittifolium* Schott) in the Philippine Islands. Pereira (1922) states that *Sclerotium* causes serious damage on Philippine rice.

In addition to host plants reported by Reinking (1918), Pereira (1922), and Ocfemia (1924) in the Philippines, *Sclerotium rolfsii* attacks sitao (*Vigna sesquipedalis* L.), patola (*Luffa cylindrica* Roem.) and (*L. acutangula* Roxb.), Jerusalem artichokes (*Helianthus tuberosus* L.), poñgapong (*Amorphophallus campanulatus* Roxb.), *Caladium* spp., sugar cane (*Saccharum officinarum* L.), avocado (*Persea americana* Mill.), and squash (*Cucurbita maxima* Duch.) and many other plants.

[1] Thesis presented for graduation, 1926, from the College of Agriculture, No. 244; Experiment Station contribution, No. 431. Prepared in the Department of Plant Pathology under the direction of Dr. G. O. Ocfemia.

The *Sclerotium* rot of pepper and tomato is usually of minor economic importance. During the wet season, however, damping-off of seedlings, wilt, and rot of stems and roots become more serious, especially in crowded plantings and where the stems and fruits of the plants touch the soil. Cases of total destruction of plants have been noted in rainy weather in poorly aërated and weedy plots in the College of Agriculture at Los Baños.

Description of Sclerotium infection of tomato and pepper

Sclerotium infection first appears as oval, elliptical, oblong or irregular water-soaked lesions of varying sizes on fruits and stems of tomato and pepper. The fungus also attacks seedlings, causing damping-off, and stems and leaves of tomato and pepper, causing wilt (plate I, figure 2), blight, and rot. If the stems are infected, a white mass of fungous hyphae with sclerotial bodies of different ages may be seen (plate I, figure 1). A white growth of mycelium appears on infected fruits of pepper (plate II, figures 1, 2, 3 and 5) and tomato (plate II, figure 6) and on leaves. Rotting of infected parts soon follows the wilting (plate I, figures 1 and 2, and plate II, figure 4). The shrinking and blackening of the infected portions take place and these extend around the stem.

On the rotting portions of the stems a thick growth of mycelium appears in moist weather. Later, the mycelium produces sclerotial bodies (plate I, figures 1 and 2, and plate II, figures 1, 2, 3, 5, and 6).

The rotting areas on the fruits are covered with white mycelium. This mycelium gradually forms numerous sclerotial bodies (plate II, figures 1, 2, 3, 5, and 6). When the fruits and stems of tomato and pepper are completely rotted, the sclerotial bodies are left on the surface of the soil where they remain dormant, or germinate and live saprophytically until susceptible hosts and favorable environment for parasitism occur.

CAUSAL ORGANISM

Taxonomy

As has been previously noted by Ocfemia (1924), the *Sclerotium* attacking tomato and pepper in Los Baños, Laguna is *Sclerotium rolfsii* Sacc.

During the present work only the imperfect stage of the fungus was used. All results obtained from experiments to induce the fungus to produce the perfect stage by changing the conditions of the environment were negative.

Morphology of the tomato and pepper strains

Mycelium. The tomato and pepper strains of *Sclerotium rolfsii* produce an abundance of mycelium on different media with the exception of sterilized avocado and moist bread. The mycelium is septate, vacuolate, and much branched (fig. 1a). Some branches are at right angles with the main hyphae while others are slightly at acute angles with the main axis (fig. 1a). A peculiar method of branching (fig. 1a) is exhibited by the mycelium. The

young branches are at first shown as knee-like projections, but as they grow longer they show the tendency to bend back to the main axis much like the formation of clamp connections. The cells of the mycelium of the tomato strain are 68.4–1270.8×2.88–9.36μ and those of the pepper strain 61.2–2028.6×3.24–7.56μ. The size of the cells of the tomato strain differs slightly from that of pepper but the difference is not considered of much taxonomic importance.

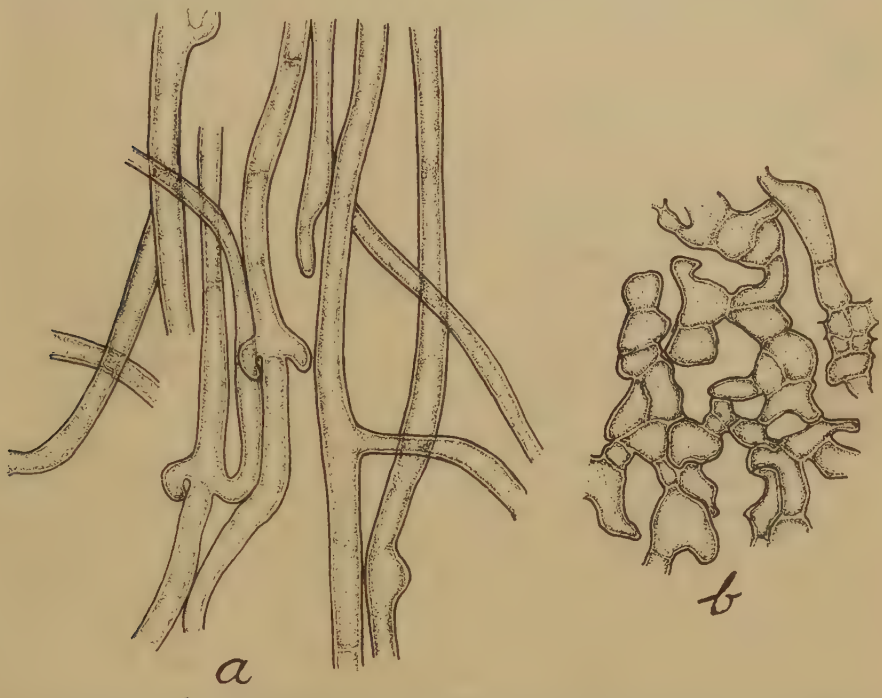

Fig. 1—(*a*) A camera lucida drawing of hyphae from a four-day-old culture with young branches bending back to the main hyphae. ×480. (*b*) A camera lucida drawing of portion of a cross section of a mature sclerotial body showing short almost oval cells and the parenchyma-like arrangement of the cells. ×480. Drawn by Mr. E. F. Roldan.

Sclerotial bodies. In the coarse dense masses of white mycelium in pure culture and in field materials (plate II, figures 1, 2, 3, 5 and 6) white, spherical, compact bodies are formed by the intertwining of the hyphae (fig. 1b), usually five to six days after the germination of the sclerotial bodies. These bodies are very small at first but they grow in size very rapidly and turn light to dark brown, becoming smooth and shiny with age. As soon as the sclerotial bodies begin to form, the rate of growth of the mycelium becomes slower. When the sclerotial bodies are mature, the mycelium ceases to grow.

Measurements of 100 sclerotial bodies of both strains from pure culture showed that the sclerotial bodies of the tomato strain vary in diameter

from 0.75–2.27 millimeters on corn meal, 0.69–1.48 on potato-dextrose agar, and 0.39–0.86 on the host plants. Those of the pepper strain range from 0.54–1.35 millimeters on potato-dextrose agar, 0.82–2.2 on corn meal, and 0.29–0.92 on the host plants. The sclerotial bodies of the tomato strain differ slightly in size from those of the pepper strain. On account of the extreme variability in the size of the sclerotial bodies and cells of different strains, due, perhaps, to differences of conditions or to some other unknown causes, the discrepancies in measurements are not considered a sufficient reason for separating the two strains of *Sclerotium rolfsii* into two distinct species.

Growth of the tomato and pepper strains on various agars and sterilized plant tissues

The growth of the fungus was studied on various media and sterilized plant tissues in the laboratory. Daily observations were made for a period of three weeks and then weekly for two months. Corn meal, potato-dextrose agar, cassava (*Manihot utilissima* Pohl.), camote, and bread were found to be good media for both strains of *Sclerotium rolfsii*. Fairly abundant growth was noted on fruits of pepper and tomato. On sterilized avocado, mango, and eggplant stems the growth was poor. The sclerotial bodies began to form when the cultures were four to nine days old. In general, the size of the sclerotial bodies of both strains did not vary on the media used, save on those on which the growth was poor. On media less suited to the fungus, the sclerotial bodies were slightly smaller than those on which the growth was luxuriant. As no noteworthy variations on the different media and sterilized plant tissues were noted in cultural studies, a detailed discussion of the results is not given.

Pathogenicity

Inoculation experiments. Mature plants of tomato, pepper, soybean, velvet bean, peanut, and eggplant in the field were inoculated with portions of mycelium or sclerotial bodies. Before inoculation, the portions to be used were disinfected with 1:1000 mercuric chloride solution and then washed with sterile water. Slits were made at the base of the plants with a flamed scalpel. Mycelium or sclerotial bodies of the fungus was inserted into the slits. The inoculated parts were covered with moist cotton to protect the fungus from drying. Control plants were prepared in exactly the same manner except that no fungous material was added.

The results of the experiments showed that infection of all plants through wounds starts on the third day. At first the progress of infection was slow, but, later, the lesions increased in size rapidly until the whole stem was infected. Infection worked very rapidly on pepper and on tomato. The inoculated plants wilted and drooped (plate I, figures 1 and 2). The control plants remained sound throughout the experiment. Field inocula-

tions on unwounded plants have given identical results although the incubation period was two to several days longer.

In the laboratory, inoculation experiments on seedlings and mature plants of tomato, pepper, peanut, soybean, and cowpea were conducted. The plants were inoculated by placing sclerotial bodies on the soil. One half of the inoculated plants and controls were placed in the damp chamber and the other half with the corresponding controls in the laboratory. Observations on inoculated plants were made daily. The infected portions showed water-soaked lesions on the seedlings more rapidly in the damp chamber than in the laboratory. Plants in the damp chamber began to rot on the third day, those in the laboratory on the fifth day. The checks remained healthy throughout the experiment. On account of moisture relations, seedlings of pepper, tomato, peanut, cowpea, and soybean, were not as readily infected in the field as were those kept in the damp chamber. Wilting took place as soon as the fungus covered the entire stem (plate I, figures 1 and 2 and plate II, figure 4).

Fruits of watermelon (*Citrullus vulgaris* (L.) Schrad.), upo (*Lagenaria leucantha* (Lam.) Rusby), pepper, and tomato were inoculated on March 31, 1925, and left covered with bell jars on the side tables in the laboratory. Small portions of the mycelium from five-day-old cultures of both strains of *Sclerotium rolfsii* were used. The results of the experiment showed that the organism started to grow on the fruits on the day following inoculation. As the fruits began to rot, sclerotial bodies were produced in enormous numbers. Measurements of these sclerotial bodies showed that they were smaller than those produced on potato-dextrose agar in test tubes, in petri dishes, and in flasks.

In the field, fruits of pepper and tomato were inoculated. The mycelium of both strains from a five-day-old culture was used. In this inoculation it was observed that the growth of the fungus was very slow. The sclerotial bodies produced were few and smaller than those produced on the fruits in the laboratory. The result shows that surrounding conditions affect the size and abundance of the sclerotial bodies produced by *Sclerotium rolfsii* Sacc. The fruits inoculated in the laboratory and those in the field rotted after six days and fourteen days, respectively.

Re-isolation. In all inoculation experiments re-isolations from all the inoculated plants in the field and in the laboratory gave positive results.

Source of inoculum for natural infection

During the rainy season in 1924 an abundance of sclerotial bodies was found in the crevices of dead woody host plants. Rotting avocado seeds covered with numerous sclerotial bodies were found. The writer collected rotting fruits of tomato and pepper covered with tough mats of mycelium and sclerotial bodies. Sclerotial bodies were also found on masses of white mycelium at the bases of coffee plants.

The mycelium and sclerotial bodies on host plants and in the soil in the field when plated out on potato-dextrose agar showed that sclerotial bodies are capable of growing, but the mycelium is not. The result of the plating out of the fungus shows that the mycelium of *Sclerotium rolfsii* Sacc. loses its viability under field conditions much faster than the sclerotial bodies, although the exact time in which they can remain alive was not determined in this work. At the present stage of the study it seems as though sclerotial bodies are the only source of inoculum for natural infection in the field.

Depth of the sclerotial bodies in the soil in relation to infection

Sclerotial bodies of the tomato and pepper strains of *Sclerotium rolfsii* were buried in sterile soil at 0.5 centimeter intervals in cans varying from 0.5 centimeter to 8.0 centimeters deep. Seedlings of pepper and tomato were grown in the infected soil, which was kept moist throughout the experiment. The results thus far obtained show that seedlings planted in soil with sclerotial bodies buried from 0.5 to 1.5 centimeters deep gave 80 per cent of infected plants. The sclerotial bodies buried deeper than 1.5 centimeters showed only 15 per cent of infection. The results obtained in this experiment seem to indicate that working out the soil mechanically will bury many of the sclerotial bodies and render them harmless to plants.

WEATHER CONDITIONS AFFECTING THE OCCURRENCE AND PREVALENCE OF THE DISEASE

Estioko's (1924-25) weather observations in the College of Agriculture for the period from 1916 to 1923 show that the rainy season begins in June and ends about January. According to this authority the temperature during this period is low. The writer noted that infected tomato and pepper in the field was very common during the months of October, November, and December, 1924, when the soil and air were always damp. The leaves of tomato and pepper on or near the ground were infected and had sclerotial bodies and mycelium on them. Examination of wilting branches and drooping leaves of tomato and pepper showed that they were attacked by *Sclerotium rolfsii* and had white sclerotial bodies and masses of mycelium on them. Observations during the rainy season in 1924 showed that damp weather is the most favorable condition for the occurrence and prevalence in the field of the disease caused by *Sclerotium rolfsii*.

Inoculation experiments carried in the field during wet weather gave positive results earlier than inoculations made during the drier part of the year. Sclerotial bodies placed on plants in the evening were found germinated the following morning. One hundred per cent of infection was noted in all the inoculation experiments in the field during the wet season.

CERTAIN CHEMICAL TREATMENTS OF THE SOIL AND THEIR RELATION TO THE CONTROL OF SCLEROTIUM ROLFSII

Effect of air-slaked lime

Two sets of experiments were conducted to determine the effects of air-slaked lime on *Sclerotium rolfsii* in the soil. Twenty-two lots of soil, each lot containing 10,000 grams, were weighed. To each set of 11 lots, 10, 50, 100, 150, 200, 250, 300, 350, 400, 450, and 500 grams of lime were added (one of the quantities to a lot) and mixed with the soil thoroughly. In the mixture the amounts of lime varied from 0.1 to 5.0 per cent. These mixtures were placed in 22 pots each 11 constituting one set. The object of the duplicates was to secure more reliable results. One half of each pot was heavily inoculated with sclerotial bodies from pure culture on potato-dextrose agar. The inoculated soil was planted to seedlings of tomato and pepper. To find if lime had any effect upon the growth of the seedlings, each mixture was checked with a control. The results of the experiment showed that the average number of infected seedlings on soil containing below two per cent of lime was 24.2 to 76.14 per cent. Seedlings on soil containing from 2 to 3 per cent lime were slightly infected. The average infection ranged from 1.02 to 13.79 per cent. In all cases the seedlings in uninoculated soil showed a perfect and healthy growth. These experiments were repeated and the same results were obtained. From the results it appears that the addition of lime at the rate of three or more per cent by weight is beneficial for reducing the damage due to *Sclerotium rolfsii* Sacc. in seed beds.

Effect of copper stearate

The effect of copper stearate[2] when mixed with the soil upon the growth of the plants and the activity of *Sclerotium rolfsii* was tested. To the known weights of soil, copper stearate powder was added in amounts to make 0.2 to 0.8 per cent by weight. One half of the lot of soil treated with the copper stearate dust was heavily inoculated with sclerotial bodies from young potato-dextrose-agar cultures in flasks. To determine the effect of the chemical upon the tomato and pepper seedlings, there was a control for every range of the chemical.

In this experiment the results obtained showed that heavy infection occurred in mixtures containing 0.2 to 0.4 per cent of copper stearate. The number of infected seedlings varied from 56.6 to 83 per cent. In mixtures containing 0.6 per cent copper stearate the average number of infected seedlings was 34 per cent.

When the copper stearate was 0.8 per cent, the activity of *Sclerotium rolfsii* was totally checked.

[2]Copper stearate was obtained from Pittsburgh Plate Glass Company, Milwaukee, Wisconsin.

In all cases the control gave 100 per cent of vigorous and uninfected seedlings. The results of the experiment showed that copper stearate applied at the rate of 0.8 per cent by weight of the soil has no effect on the growth of tomato and pepper seedlings but wholly checks the ravages of the fungus. For seed bed purposes this chemical gave results that warrant further tests.

Effects of ground sulfur

Two sets of experiments were conducted in the laboratory to test the effect of ground sulfur upon *Sclerotium rolfsii* in the soil. The method of treatment followed was similar to that used with the lime and copper stearate. Severe infection averaging from 65 to 90 per cent was observed in lots containing 0.33 to 1.33 per cent by weights of sulfur. The average infection on plants in lots containing from 1.66 to 2.33 per cent by weight of sulfur was from 30 to 45 per cent. In lots containing from 2.66 to 3.33 per cent sulfur by weight no infection was noted. Identical results were obtained when the experiment was repeated.

Effect of some organic mercury compounds

The effect of Corona 640[3] and Uspulun[4] upon *Sclerotium rolfsii* in the soil was tested in the laboratory. Aqueous solutions of 0.12½, 0.25, 0.40, 1.0 and 2.0 per cent[5] of each were used.

Thirty pots of soil were planted to seedlings of pepper and tomato. In 20 pots the soil around the base of the plants was stirred and heavily inoculated with sclerotial bodies from young cultures of *Sclerotium rolfsii* on potato-dextrose agar. The remaining 10 pots were not inoculated, they were used to determine the effect of the various strengths of the solutions on the growth of the plants. The pots were divided into 10 sets of two inoculated and one uninoculated to a set. Five sets were watered once with different concentrations of Corona 640 solution and the remaining five were moistened once with the different strengths of Uspulun solution.

In the experiment it was found that infection was from 60 to 75 per cent in pots treated with Corona 640 below 0.5 per cent concentration. The pots treated with the 0.5 per cent solution, or over, were free from infection.

In pots treated with Uspulun below 1.0 per cent the average infection was from 56 to 70 per cent. In pots treated with the 1.0 per cent solution, or over, the seedlings were free from infection. All plants in the uninoculated pots treated with different concentrations of aqueous solutions of the two

[3], [4] Trade names of the organic mercury compounds used. Corona 640 was supplied by Pittsburgh Plate Glass Company, Milwaukee, Wisconsin. Uspulun by the Bayer Company, Inc., New York.

[5] The solutions were prepared by dissolving a known weight of the powder in small amounts of tap water making the volume of the solution to 100 cc. in a graduated cylinder.

compounds were normal. The results showed that the solutions did not have any injurious effect upon the seedlings, but had controlling effect upon *Sclerotium rolfsii* in the soil when applied at certain strengths.

The experiments were repeated and identical results were obtained. Although the results are promising, no definite recommendations are given in regard to the use of these chemicals for the control of *Sclerotium rolfsii* until further experiments are carried out in the field and in the laboratory.

SUMMARY

1. The *Sclerotium* disease of tomato and pepper due to *Sclerotium rolfsii* Sacc. is common in the College of Agriculture fields at Los Baños, Philippine Islands, during the rainy season.

2. *Sclerotium rolfsii* causes damping-off of seedlings, wilt, blights, rots of fruits and roots of tomato, pepper, and other plants.

3. On fruits of pepper and tomato the disease produces water-soaked lesions which later shrink and become covered with mycelium and sclerotial bodies. Seedlings, stems, leaves, and roots of these plants may be infected.

4. The fungus grows readily on common media and sterilized plant tissues, producing an abundance of mycelium and sclerotial bodies. The sclerotial bodies differ in abundance and in size on different media, sterilized plant tissues, and in the field. The difference is not of taxonomic significance. No spore-producing stage was noted.

5. The fungus grows from sclerotial bodies or from young hyphae. Hyphae and sclerotial bodies grow readily in moist conditions.

6. Sclerotial bodies are the chief sources of inoculum in the field. The fungus remains alive by producing sclerotial bodies. If the sclerotial bodies are buried about two centimeters in the soil they cannot infect plants. Further experiments are under way to test the effects upon the viability of the fungus of burying sclerotial bodies at different depths.

7. The disease may be controlled by sanitary measures, using chemicals, such as lime, sulfur, copper stearate, Corona 640, and Uspulun. Further experiments should be made to check the beneficial effects obtained from the addition of these compounds to the soil for the control of *Sclerotium rolfsii* in seed beds and in the field.

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ILLUSTRATIONS

PLATE I

Fig. 1. Five-day-old inoculated pepper plants showing infection on the stems. The stems are covered with masses of fungous hyphae with small sclerotial bodies. ×⅓.

Fig. 2. Five-day-old tomato plants inoculated through soil showing infected stems covered with masses of mycelium and small sclerotial bodies. ×⅓.

PLATE II

Fig. 1. Portion of five-day-old inoculated pepper fruit showing a thick mass of coarse mycelium and developing sclerotial bodies. ×1⅓.

Fig. 2. Portion of a five-day-old inoculated pepper showing a coarse dense mass of hyphae covering the diseased portion. Sclerotial bodies are beginning to form. ×1⅓.

Fig. 3. Portion of a five-day-old inoculated pepper showing the long and coarse hyphae and developing sclerotial bodies on the rotting portion. ×1⅓.

Fig. 4. Five-day-old inoculated pepper plants showing the rotting portion of the infected stem covered with a mass of hyphæ and sclerotial bodies. ×½.

Fig. 5. Portions of a five-day-old inoculated pepper fruit showing the coarse aërial hyphae and developing sclerotial bodies. ×1⅓.

Fig. 6. Eight-day-old inoculated tomato fruit showing the dense mass of mycelium and mature sclerotial bodies. ×1½. (All photographs by the Photographic Division, Department of Agronomy, College of Agriculture, Los Baños, P. I.)

PLATE I

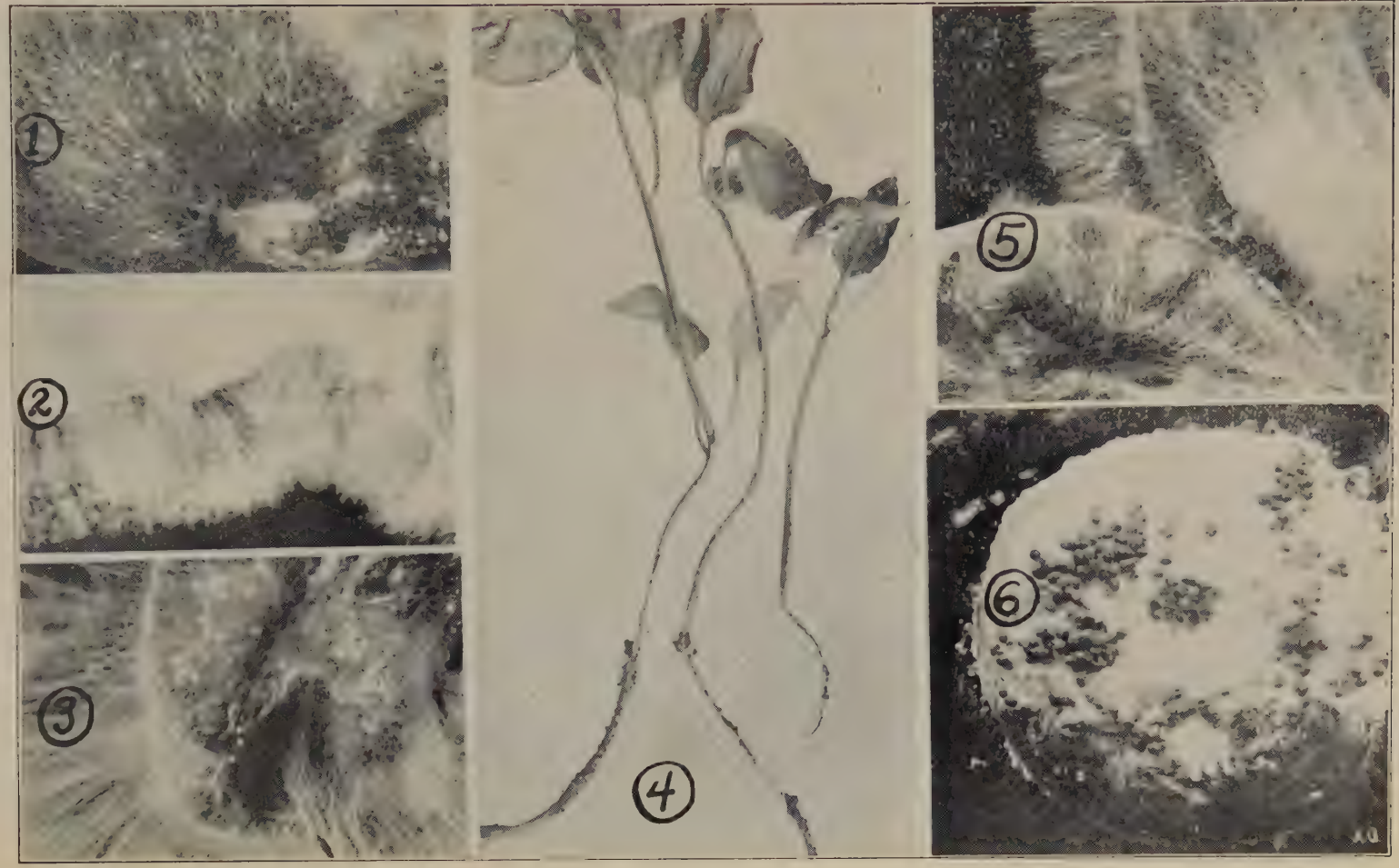

PLATE II

A SHORT CUT METHOD FOR DETERMINING, APPROXIMATELY, PROFITS AND LOSSES IN A POULTRY PROJECT[1]

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The chicken raiser is naturally interested to know whether his poultry flock is laying a sufficient number of eggs to pay for its keep or not. The following question arises, "Is it possible for the poultry raiser to determine easily, at any given time of the year, whether or not his chickens are laying a sufficient number of eggs to pay for the cost of production?" This question may be answered in the affirmative by the poultry farmer for ordinarily he is supposed to keep careful records of all the expenses incurred in the production of eggs by his flock. This he can do, however, only after computations of the actual costs involved in the operations.

After studying the matter carefully I have come to the conclusion that it is possible to determine, approximately, by the use of a simple formula, whether the flock is laying profitably or not. This formula gives approximately what should be the percentage production of the flock, or, in other words, the number of eggs a flock of hens should produce in one day in order to cover all normal costs of production. These costs include the cost of feeds, housing, labor, depreciation, interest on the investment, hazards or risks.

NECESSARY DATA

Cost of a kilogram of feed. No matter what kind and what amount of additional feed is given to the birds, this represents some cost and the value of one kilogram should be given even if only an estimate. If the feed consists of either rice or corn, or any other feed that can be obtained from the market, it is best to give the market price. If the feed consists of table and kitchen scraps, a very fair estimate can be made, which may be placed at about two centavos a kilogram, although it may be worth much more than that if the feeding value of the feed is considered. To have a definite basis for computation, the conditions as they exist in the College, in so far as they are known with certainty, are used in this paper.

[1] Experimental Station contribution No. 432. Read before the Los Baños Biological Club January 20, 1927. Received for publication February 1, 1927.

At the time of this writing, December 1, 1926, the prices of the feeds constituting the College ration were:

	A kilogram
Corn	₱0.067
Palay	0.093
Rice bran	0.067
Copra meal	0.067
Dried shrimps	0.217

The College ration consists of grain containing one part by weight of corn and palay, and mash containing four parts, by weight also, of rice bran, three of copra meal, two of corn meal, and one of dried shrimps. The grain and the mash feed are given in the proportion of one of the grain to one of the mash. At the given prices, the cost of the College ration is 8.1 centavos a kilogram.

Cost of eggs per dozen. The hens should be credited for all the eggs that they produce. If the eggs that the hens produce are consumed by the family, these should be given the market price in the locality. Considering that the conditions are similar to those in the College, the cost of table eggs during the period corresponding to that given above is 72 centavos a dozen. The fluctuations of the price of eggs must be considered when applying same to the formula, as it is not fair to charge 72 centavos a dozen for eggs produced in the more favorable months of the year when eggs actually are produced at a much lower cost than during the month of December.

Feed consumption. From the results of feeding trials carried on in this College during different years, the amount of feeds consumed by average hens varies from about twenty-eight to about thirty-one kilograms in one year. (Fronda, 1919; Taleon, 1924; Crucillo, 1926). For the sake of simplicity in the computations, the average of thirty kilograms is used. This may be considered as consisting of one-half grain and one-half mash, thus the average cost of feeds per kilogram as given above may be used at any time. This, however, does not vary much, and if it is desired, the actual amount of feeds consumed may be used. This, however, will lead only to a more complicated determination of the price of the feed.

The factor "20". The figure "20" that is given in the formula is an approximate factor which I have found applicable for use with ordinary flocks consisting of either Cantonese or Native fowls. It is a mathematical constant to be used in finding the desired result.

The determination. The formula that is used in the determinations of approximate profits or losses is as follows:

$$\frac{\text{Cost of feed per kilogram}}{\text{Cost of eggs per dozen}} \times \text{Total feed 100 hens will eat in one day} \times 20$$

By applying to this formula the figures given above, we have:

$$\frac{8.1}{72} \times \frac{3000}{365} \times 20$$

This formula, if worked out, will give 18.49 as the answer. This means that 18.49 eggs must be produced by a flock of 100 hens in one day in order that all of the expenses of production may be paid. In other words the flock must have a daily production of about 18.49 per cent.

The cost of egg production. In determining the actual cost of egg production, a number of items enter into the computation, the principal among which is the feed which normally represents from one-half to two-thirds of the total cost of production (Jull, *et al*, 1924). For the purposes of this paper, the average of 60 per cent is used. Taking the total cost of production as 100 per cent, the remaining 40 per cent pays for the labor, depreciation and use of buildings, equipment, the use of land, litter, the interest on the investment and the hazards of the business. In the absence of actual figures obtained under College conditions, this division of expenses has been taken for granted.

Proof. To prove that under the conditions given here, 18.49 eggs will be sufficient to pay the cost of production is a simple matter. If each hen consumes 30 kilograms of feed in one year, in one day, therefore, she can eat 0.0822 kilogram. At 8.1 centavos a kilogram of feed, the cost of the feeds consumed by 100 hens in one day will be $100 \times 0.0822 \times 8.1$ centavos or 66.6 centavos. If this cost of feeds represents only 60 per cent of the entire cost of production, the entire cost, therefore, will be ₱1.11, which is also the cost of 18.49 eggs at 6 centavos each or at 72 centavos a dozen.

Results under other conditions. In a majority of cases, especially where a definite ration is fed to the chickens, the cost of feeds per kilogram remains more or less constant throughout the year. On the other hand, the cost of eggs a dozen is more variable, depending upon the supply and demand. In this College, eggs are more expensive during the months of August, September, October, November, December, and January, than during the rest of the year. To furnish a ready guide for use as reference under any reasonable set of conditions, table 1 was prepared.

TABLE 1

Showing the number of eggs necessary from each 100 hens a day to pay for production under different conditions

COST OF EGGS A DOZEN	NUMBER OF EGGS NECESSARY FROM EACH 100 HENS A DAY TO PAY FOR PRODUCTION WHEN A KILOGRAM OF FEED COSTS—IN CENTAVOS:								
	6	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
centavos									
24	41	48	55	62	68	75	82	89	96
36	27	32	37	41	46	51	55	59	64
48	21	24	27	31	34	38	41	45	48
60	17	19	22	25	27	30	33	36	38
72	14	16	18	21	23	25	27	30	32
84	12	14	16	18	20	22	23	25	27

From table 1 it may be seen that the higher the cost of feeds given to the birds, under a given market price of eggs, the larger the number of eggs that must be produced in order to pay for production. Under the present conditions in the College, where standard eggs are sold at 72 centavos a dozen and feeds cost 8.1 centavos a kilogram, any number of eggs produced over 18.49 is net profit. Take, for instance, the conditions obtaining during the month of March when eggs sell at only 60 centavos a dozen, and the cost of feeds remain the same, an estimate on the number of eggs that should be produced may be had by referring to table 1 which gives under the column for 8 centavos on the line of 60 centavos that the number of eggs needed is roughly 22. A more exact figure may be obtained by proper application of the available data to the formula.

Profits to be expected during the different months of the year. A most interesting study may be made by comparing tables 1 and 2. Table 2 gives the four-year average percentage production of the Cantonese and Native breeds of fowls in the College. In the last column of this table the cost of table eggs per dozen in the College during the year 1925-1926 are given. To calculate how much profit may be expected from a flock of chickens during the different months of the year, the figures for the month in table 2 may be compared with the corresponding figures for the prices of the eggs per dozen and of the feeds per kilogram in table 1.

TABLE 2

Giving the percentage production and price of eggs per dozen in the College of Agriculture

MONTHS	CANTONESE (4-YR. AVERAGE)	NATIVES (4-YR. AVERAGE)	COST OF EGGS PER DOZEN
			centavos
January	30.3	24.2	72
February	35.2	30.9	60
March	33.6	35.2	60
April	32.1	32.6	60
May	28.1	31.2	60
June	27.4	30.3	60
July	25.9	27.6	60
August	20.8	22.6	72
September	24.9	23.1	72
October	22.0	21.7	72
November	23.0	19.6	72
December	18.8	19.2	72

As an illustration, the following conditions are assumed. Supposing Native hens are being kept, and one wishes to find the minimum number of eggs that must be produced in order to pay during the month of May. By referring to table 2, it may be found that the cost of table eggs during

this month is 60 centavos a dozen, and granting that the cost of feeds is 8 centavos per kilogram, reference is then made to table 1 where the approximate lowest limit of the number of eggs to be produced for every 100 hens may be seen to be 22. Referring to table 2, it may be seen that the normal production during this month is 31.2 eggs for every 100 hens; therefore, this represents a net gain of about 9 eggs. Whatever number of eggs is produced beyond this normal production for the month is additional net profit for the producer.

SUMMARY

A method is described for determining the approximate number of eggs that a flock of chickens should produce in order that the project will pay.

With the method given, the number of eggs that should be produced by a flock of chickens in order to gain under any given set of conditions may be roughly determined.

Knowing the normal percentage production during the different months of the year, approximate profits made or losses incurred in a poultry project may be easily computed.

This process is recommended to practical poultry raisers. Where accuracy is desired and one is willing to spend time to get it, the use of actual production costs is recommended.

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THE CALORIFIC VALUE OF BAGASSE OF DIFFERENT VARIETIES OF SUGAR CANE GROWN IN THE COLLEGE OF AGRICULTURE [1]

FELIX S. SORIANO

INTRODUCTION

The calorific value of bagasse from different varieties of sugar cane may differ within certain limits, and even in the same variety the influence of age, soil, climate, cultural treatment, etc., may cause differences in the calorific value of the so-called fiber. No studies on the heat value of bagasse of either the foreign or native canes have been made in the Philippines, although positive knowledge on the subject would be valuable and timely.

Review of previous work

Many workers have studied the heat value of bagasse in comparison with that of other fuels, such as firewood, trash, and coal.

Geerligs (1909) found the calorific value, an average of Java bagasse to be 4182.6 B. T. U.[2] per pound (2323 Cal. per kgm.). But a bagasse having 46.6 per cent fiber, 4.5 per cent sucrose, 0.5 glucose, 47.5 per cent moisture and 0.9 per cent ash gave only 3868 B. T. U. per lb. (2143 Cal. per kgm.). Geerligs pointed out that the drier the bagasse, the higher is its calorific value.

Deerr (1911) also found that the higher fibered bagasse gives the best fuel value. He gives a range of difference of from 8289 (4605 Cal. per kgm.) to 8514 (4730 Cal. per kgm.) B. T. U. on dry bagasse. He attributes the difference to the varieties in the proportion of rind and pitch tissues.

Norris (1912) made a thorough investigation on the heat of combustion of bagasse from Hawaiian cane. He found that the average thermal value of dry Hawaiian bagasse is 8100 B. T. U. per lb. or (4500 Calories per kgm.) He gave the averages of six varieties of Hawaiian canes, as follows:

	Cal. per kgm. [3]	*B.T.U. per lb.*
H69	4370	7866
H27	4491	8083
H20	4513	8123
H239	4318	7772
H355	4534	8161
H349	4516	8129

[1] Thesis presented for graduation, 1926, with the degree of Bachelor of Science in Agriculture from the College of Agriculture No. 245; Experiment Station contribution No. 433. Prepared in the Department of Agricultural Chemistry under the direction of Professor Hilarion G. Henares.

[2] British Thermal Unit is the amount of heat required to raise the temperature of one pound of water from 62° to 63° F.

[3] 1 kgm. Cal. = 1.8 B. T. U. per lb.

Moisture plays an important part in the reduction of the fuel value of bagasse. As is well known, the higher the moisture of a sample, the less will be the amount of combustible matter per unit weight. Aside from that, the presence of water also reduces the available heat from the combustion of the bagasse, as the water absorbs heat on evaporation. The following tabulation, taken from Norris (1912), gives the amount of heat available per unit weight of bagasse corresponding to various percentages of moisture.

Percentage of moisture	*Cal. per kgm.*	*Heat content B. T. U. per lb.*
42	2610	4698
43	2562	4617
44	2517	4536
45	2473	4455
46	2428	4374
47	2383	4293
48	2338	4212
49	2293	4131
50	2248	4050
51	2203	3969

Object

The object of the experiments reported in this paper was to determine the heat value of the bagasse from some cane varieties grown in the College of Agriculture.

Time and place of the present work

This investigation was carried out during the first semester of the College years 1924–25 and 1925–26 in the U. P. Sugar Mill and the Chemistry Laboratory of the College of Agriculture, Los Baños, Laguna.

MATERIALS

The cane varieties used

1. A bud variant of Big Tana
2. Demerara 1135
3. Hambledon Queensland 426
4. Hawaii 20
5. Hawaii 69
6. Hawaii 27
7. Luzon White
8. Malagache
9. Mindoro Purple
10. Negros Purple
11. New Guinea 40
12. P. B. No. 42
13. Uba Cane
14. A bud variant of Luzon White
15. Tigbao Mestiza
16. Java 247
17. P. B. No. 39

The apparatus used

1. Bomb calorimeter and accessories
2. Electric oven
3. Chopping machine
4. Chemical glass ware, etc.

METHODS

Two methods were used in the determination of the calorific values: (1) By calculation from the result of proximate analysis; and (2) By actual determination of the heat of combustion by the use of a bomb calorimeter.

Method of sampling

Representative samples from the sun-dried bagasse of each variety turned out during the milling season, were taken and bundled. The bagasse in the bundles were sub-sampled by cutting the large pieces into smaller ones, taking one portion of the cut pieces and chopping them in a meat chopper to a fine state of sub-division. The chopped bagasse was then put in separate bottles, one bottle for each variety.

In the case of varieties of cane not milled by the U. P. Sugar Mill, the splitting was done in the following manner: the canes were cut in the field and each variety milled separately in a small hand mill. The moist bagasse was then dried and sampled in the same way as the U. P. Sugar Mill bagasse.

Heat value from proximate analysis

The methods of analysis followed in this work are:

Moisture. Small constant weight watch glasses were used as weighing vessels. One to 5 grams of bagasse were taken and dried for 3 hours at a time, in an electric oven at 110°C., cooled in a desiccator, then weighed. The drying was repeated until constant weight was obtained.

Ash. Ash was determined by weighing from 2 to 5 grams of bagasse. This was dried and then ignited to constant weight. From the weight of the residue the percentage of ash in the sample was calculated.

Nitrogen. The perchloric acid method was used. Samples of 1 to 3 grams each were weighed in Kjeldahl flasks and treated with 25 cc. concentrated sulfuric acid together with 2 grams of copper sulfate ($CuSO_4.5H_2O$) and 2 cc. of perchloric acid. Each sample was digested until colorless, then cooled and diluted with 250 cc. water, then treated with 100 cc. saturated sodium hydroxide, then distilled. The distillate was collected in a 250 cc. Erlenmeyer flask containing 50 cc. of standard sulfuric acid. The average of three determinations was then taken for each sample.

Ether extract. Ether extract was determined by weighing 2 to 5 grams of bagasse in a paper thimble. The thimble, with content, was dried to constant weight at 110°C., and then placed in the Soxhlet's ether extraction apparatus for 3 days to assure complete extraction. Then the thimble was again dried to constant weight. The difference in the constant weight before and after extraction is the ether extract.

Crude fiber. Crude fiber was determined by weighing about 3 grams of bagasse and digesting it with 1.25 per cent of sulfuric acid in a reflux flask for 30 minutes. The fiber was then filtered through cloth and the

residue washed with water and digested again with 1.25 per cent sodium hydroxide. This residue was again filtered and then washed with the water until it was free from alkali. The residue was put in a tared dish and dried to constant weight. It was then ignited and the difference in weight before and after ignition is the crude fiber.

Total carbohydrates. Total carbohydrates were determined by difference.

The calorific value was then calculated from the proximate analyses by the use of factors.[4]

Bomb calorimeter determinations

Pellets of the finely chopped samples, weighing from 1 to 2 grams were made in a pellet press. These pellets were then placed in test tubes and corked tightly. In every determination the water cylinder of the calorimeter was weighed in a Cenco balance and distilled water was added to the amount of 1800 grams. The temperature of the water was kept 2 to 3°C. lower than the room temperature, by adding ice or ice cold water.

The method and technique used were essentially those suggested by Atwater and Snell (1903). The description of the bomb and its use are given in the *Journal of the American Chemical Society*, volume XXV, No. 7. For each series of determination, blank runs with sodium benzoate were made.

RESULTS AND DISCUSSION

Table 1 gives the proximate analyses of all the varieties of bagasse examined. In column 7 are given the calculated calorific values of the moist bagasse. Columns 8 and 9 show the calculated calorific value for the dry bagasse based on the moist sample.

Table 2 shows the heat value determined by direct calorimetry, that is, by the use of bomb calorimeter.

Table 3 shows the comparison between the values calculated from proximate analyses and those determined by the bomb calorimeter. The values from proximate analyses are in all cases lower than the values determined by the bomb calorimeter, showing that there was a common cause or causes for this difference. What the causes might be were not determined. One of the causes, however, may be due to the protein content of the bagasse. The factor 4.1 for protein is used in connection with the combustion of foodstuff in the animal body where combustion is incomplete. In the calorimeter, combustion is, of course, complete and hence higher values are obtained.

It is believed that the figures obtained from direct calorimetry are more accurate than the calculated values (table 1, columns 8 and 9).

Table 3, column 2, shows that the Uba cane has 8186 B. T. U. (4548 Cal. per kgm.) the highest calorific value, and Hawaii 20, 7761 B. T. U.

[4] One gram ether extract produces 9.3 Calories and 1 gram each of proteins, crude fiber, and total carbohydrates produces 4.1 Calories.

(4312 Cal. per kgm.) the lowest. The average calorific value of all the varieties analyzed was 7976 B. T. U. (4431 Cal. per kgm.).

When making calculations on the net calorific value as obtained from the furnace, it must be remembered that the figures in table 2, columns 3 and 4 represent the highest value, as the determinations were made under room temperature in the calorific bomb where the latent heat of condensation due to combustion was included in the measurements. This heat (latent heat of condensation) is lost in actual practice, where the vapor is carried away through the chimney.

In the calculation of the real calorific value of bagasse as fuel in the furnace, the heat absorbed by the moisture in bagasse should be subtracted from the gross heat of dry bagasse. Thus Luzon White bagasse having a moisture content of 47 per cent will give a net calorific value of 3594 B. T.U. per lb. (1997 Cal. per kgm.) when burned in the furnace. This value is calculated from table 2, column 4. The calorific value of dry bagasse of Luzon White is 7,885 B. T. U. per pound. The gross heat generated in the furnace will, therefore, be $7{,}885 \times (1.00 - 0.47) = 7{,}885 \times .53 = 4{,}179$ B. T. U. Not all of this heat is available for generating steam in the boiler as some of it is used in converting 0.47 pound of water from room temperature to the temperature of the chimney, which in this case is around 500°F. The net heat will then be $4{,}179 - 0.47\,[212 - 80 + 972 + 0.5\,(500 - 212)] = 3{,}594$ B. T. U. per lb. (Norris, 1912) (1997 Cal. per kgm.), the amount of heat theoretically available for steam production.

It may be seen in table 3, columns 2 and 3, that the calorific values as determined in the bomb calorimeter show in general that high fibered bagasse has a high calorific value, hence a high fuel value. There are some varieties as Hambledon V, which has a low fiber content (31.15 per cent) as compared with Luzon White which has 39.10 per cent, but its calorific value is higher. The Hambledon V has 8026 B. T. U. per lb. (4459 Cal. per kgm.) and the Luzon White, 7885 (4318 Cal. per kgm.). Also, with the two varieties, Hambledon V and 426, there is a difference with the Hawaiian canes, H-69 having a fiber content of 33.73 per cent and H-27, 35.11 per cent fiber, but H-69 has 7905 B. T. U. per lb. (4292 Cal. per kgm.), while H–27 has 7767 B. T. U. per lb (4315 Cal. per kgm.). (See table 2, column 4.) According to Deerr (1911) these irregularities or differences which seem peculiar may be explained by the difference in the proportion of the rind and pitch tissues.

The writer found that the average calorific value of the three Hawaiian varieties used in this test; namely, H–20, H–27, and H–69 is 7878 B. T. U. per lb., or 4321 Cal. per kgm., while Norris (1912) found an average for the same variety to be 8024 B. T. U. per lb. or 4347 Cal. per kgm. This small difference may be due to the difference in age and in soil or climatic conditions.

Since some of these varieties are not grown in the Philippines on a commercial scale, it would not be justifiable to use the above average of 7976 B. T. U. (4431 Cal. per kgm.) for calculations. However, it is believed that for engineering purposes, it is safe to use 7975 B. T. U. per pound or 4430 Cal. per kgm. of dry bagasse, the average calorific value of the two most extensively grown varieties; namely, Negros Purple and Luzon White.

SUMMARY

The calorific values of bagasse of different varieties of sugar cane grown in the College have been determined.

Of the 18 varieties of sugar cane analyzed in the College of Agriculture, the Uba cane, according to the calorimetric test, showed the highest fuel value; Tigbao Mestiza and Mindoro Purple the second highest; and the Hawaiian canes, except H–69, the lowest.

Calorific value determined with a bomb calorimeter is almost invariably higher than that obtained from calculation from the proximate composition of the bagasse.

The two most popular varieties of cane grown in the Philippines, the Negros Purple and Luzon White, gave an average calorific value of 7975 B. T. U. per pound, or 4430 Cal. per kgm. on the dry basis.

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TABLE 1

Calorific value calculated from proximate analysis

VARIETY	1 MOISTURE	2 ASH	3 ETHER EXTRACT	4 CRUDE FIBER	5 PROTEIN N×6.25	6 TOTAL CARBOHYDRATES	7 CALORIFIC VALUE IN CALORIES PER KGM. On moist sample	8 CALORIFIC VALUE IN CALORIES PER KGM. On dry sample	9 CALORIFIC VALUE IN B.T.U. PER POUND On dry sample	10 CALORIFIC VALUE IN B.T.U. PER POUND Crude fiber on dry bagasse
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*				
1. A bud variant of Big Tana	14.48	3.21	2.33	31.20	0.76	51.00	3584	4190	7360	36.48
2. Demerara 1135	21.32	3.39	3.71	25.58	1.39	44.61	3280	4169	7505	32.51
3. Hambledon V	16.54	2.34	1.44	26.00	0.67	53.01	3401	4075	7335	31.15
4. Hambledon 426	14.80	2.63	4.31	26.75	0.78	50.73	3610	4237	7625	31.39
5. Hawaii 20	17.00	3.11	6.85	24.60	1.04	47.40	3754	4522	8140	29.63
6. Hawaii 69	16.25	3.01	5.01	28.25	1.41	46.07	3571	4264	7675	33.73
7. Hawaii 27	19.86	2.88	5.14	28.14	1.14	42.84	3435	4282	7715	35.11
8. Luzon White	13.23	3.76	3.56	33.99	1.22	44.24	3589	4138	7450	39.10
9. Malagache	18.84	3.03	5.85	29.83	1.01	41.44	3508	4322	7780	36.75
10. Mindoro Purple	17.95	2.95	7.01	28.36	0.77	42.96	3608	4397	7915	34.56
11. Negros Purple	13.69	3.45	3.36	29.48	1.19	48.43	3556	4120	7416	34.16
12. New Guinea 40	17.97	2.46	7.79	29.12	1.12	41.54	3368	3902	7023	36.23
13. P. B. 42	15.59	3.65	5.65	26.36	0.99	47.76	3605	4271	7690	31.23
14. Uba Cane	16.31	2.32	5.13	32.02	0.59	43.63	3603	4304	7745	38.79
15. A bud variant of Luzon White	15.38	3.67	8.41	30.29	1.07	41.18	3756	4440	7990	35.79
16. Tigbao Mestiza	15.88	2.11	4.53	34.92	0.83	41.73	3598	4277	7700	41.51
17. Java 247	17.85	2.16	3.14	33.76	1.51	41.58	3443	4191	7545	41.10
18. P. B. 39	17.17	2.72	1.18	29.15	0.75	49.03	3346	4040	7270	35.19
Average								4230	7614	35.21

TABLE 2

Calorific value determined by bomb calorimeter

VARIETY	1 MOISTURE	2 CALORIFIC VALUE IN CALORIES PER KGM. On moist bagasse	3 CALORIFIC VALUE IN CALORIES PER KGM. Calculated on dry bagasse	4 CALORIFIC VALUE IN B.T.U. PER POUND Calculated on dry bagasse
	per cent			
1. A bud variant in Big Tana	9.42	3981	4395	7911
2. Demerara 1135	12.92	3800	4364	7855
3. Hambledon V	9.11	4057	4459	8026
4. Hambledon 426	9.45	4028	4448	7920
5. Hawaii 20	8.99	3925	4312	7761
6. Hawaii 69	9.15	3990	4292	7905
7. Hawaii 27	10.01	3883	4315	7767
8. Luzon White	9.43	3968	4318	7885
9. Malagache	7.67	4070	4408	7934
10. Mindoro Purple	7.71	4162	4510	8118
11. Negros Purple	8.98	4079	4481	8065
12. New Guinea 40	9.73	4064	4502	8103
13. P. B. 42	6.94	4118	4425	7965
14. Uba cane	4.95	4323	4548	8186
15. Bud variant of Luzon White	5.82	4249	4512	8121
16. Tigbao Mestiza	5.70	4263	4521	8138
17. Java 247	6.19	4198	4475	8055
18. P. B. 39	3.78	4299	4468	8042
Average			4431	7976

TABLE 3

Calorific value on dry bagasse by proximate analysis and bomb determination compared

VARIETY	1 B.T.U. PER LB. BY PROXIMATE ANALYSIS	2 B.T.U. PER LB. BY BOMB CALORIMETER	3 CRUDE FIBER ON DRY BAG
1. A bud variant of Big Tana	7360	7911	36.48
2. Demerara 1135	7505	7855	32.51
3. Hambledon V	7335	8026	31.15
4. Hambledon 426	7625	7920	31.39
5. Hawaii 20	8140	7761	29.63
6. Hawaii 69	7675	7905	33.73
7. Hawaii 27	7715	7767	35.11
8. Luzon White	7450	7885	39.10
9. Malagache	7780	7934	36.75
10. Mindoro Purple	7915	8118	34.56
11. Negros Purple	7416	8065	34.16
12. New Guinea 40	7023	8103	36.23
13. P. B. 42	7690	7965	31.23
14. Uba cane	7745	8186	38.26
15. A bud variant of Luzon White	7990	8121	35.79
16. Tigbao Mestiza	7700	8138	41.51
17. Java 247	7545	8055	41.10
18. P. B. 39	7270	8042	35.19
Average	7614	7976	35.21

PRELIMINARY EXPERIMENTS ON THE USE OF CAMOTE (IPOMOEA BATATAS, LINN.) AS PASTURE AND AS A SOILING CROP FOR GROWING BREEDING PIGS[1]

EULOGIO RODRIGUEZ, JR., AND GEORGE KHOMSON

INTRODUCTION

Swine can be raised satisfactorily on concentrates alone, but experiments as well as experience have shown that through the use of suitable forage and pasture crops, pork may be produced at a much lower cost than when pigs are maintained in dry lots on expensive concentrates.

Because of the benefits derived from the use of forage crops in pork production, special attention has been paid in experiment stations in the United States to studies in detail on these crops in connection with swine raising. The results obtained from these studies can serve only as general guides for hog raisers in the Philippines. It behooves us to determine, as accurately as possible, the place which each of our own forage crops may occupy on a well organized hog farm. The Department of Animal Husbandry of this College has experimented with cowpeas, sorghum, and sweet potatoes, and is now using the latter extensively for forage. It is of value to know how these and other crops may be utilized in hog feeding to the best advantage in the Philippines and to determine how far each goes to meet the ideal forage and pasture crop for hogs.

Review of the important literature on the subject

Bautista (1918) states that young pigs can be raised cheaper when pastures are used with concentrates than when grain alone or pasture alone is used.

Lago (1924), in hog feeding experiments involving the use of self-feeders, observed that during the first few days the pigs consumed only a little grain as they were inclined to forage on succulent young stems, leaves, and tubers of camotes. He also observed that the pigs ate the tender tips first, then when no more could be found, the younger leaves.

Allas (1924) in his work using rice bran, corn, and copra meal as supplements to camote vines for growing pigs states that pigs relish camote, consuming both leaves and tubers.

[1] Theses presented for graduation with the degrees of Bachelor of Agriculture and Bachelor of Science in Agriculture from the College of Agriculture Nos. 246, and 247; Experiment Station contribution No. 434. Prepared in the Department of Animal Husbandry under the direction of Dr. Mariano Mondoñedo.

Henry and Morrison (1923) state that through the use of suitable forage and pasture crops, pork may be produced at much lower cost than when pigs are maintained on dry lot. They state also that pasture is especially important for growing pigs, as it keeps them thrifty.

Bell, Winchester, and Marston (1923) report that pigs on pasture make more rapid gains than pigs in a dry lot; and pigs fed a well-balanced ration in a dry lot, will not make as rapid gains as pigs on pasture fed on the same feed.

Objects of the work

The objects of this work were as follows: (*a*) To determine the value of camote when used as a pasture and as a soiling crop for growing pigs on a ration consisting largely of corn, rice bran, and copra meal; (*b*) To determine the advisability of using camote as pasture or soiling.

Time and place of the present work

These experiments were conducted in the Department of Animal Husbandry, College of Agriculture, Los Baños, beginning January 14, 1924, and extended to November 12, 1925.

MATERIALS AND METHODS

Materials

The pigs. Experiments I and II were made on twenty-six pigs, all females, from the College herd. They were all Berkshire-Jalajala grades. The pigs used in experiment III were Berkshire-Jalajala shotes.

Feeds. The feeds used in the different experiments consisted of corn, rice bran, and copra meal. The corn was of the Native Yellow Flint variety, and cost ₱0.085 to ₱0.088 a kilogram. Rice bran, obtained from Biñang and Cabuyao Rice Mills at ₱0.072 to ₱0.073 a kilogram, was of second-class grade, that is, a small amount of ground hulls was found mixed with the bran. Copra meal was bought from the Copra Milling Corporation, Manila, in hydraulic pressed cakes at ₱0.05 to ₱0.065 a kilogram according to the time. Dried shrimps at ₱0.23 and molasses at ₱0.02 a kilogram were used in addition to the corn, rice bran, and copra meal.

Minerals. In each experiment, to every 100 kilograms of the ration mixture used, one kilogram of the followig mixture was added.

Mixture

Potassium nitrate	10 grams
Sodium sulfate or magnesium sulfate	80 grams
Ferrous sulfate	10 grams
Corn cob charcoal	450 grams
Salt	450 grams
Total	1,000 grams

EXPERIMENTS

Experiment 1

Object. The object of this experiment was to determine the value of camote as a soiling crop for young breeding pigs.

Plan. The experiment was begun January 14, 1924, and closed April 24, 1924, covering a period of one hundred and eleven days. Twelve gilts were used. They were all yearlings and were about ready to breed.

The pigs were weighed three times within the week previous to the beginning of the experiment to determine the initial live weight. They were then divided into two lots of six pigs each; designated as lot I and lot II. The lots were as uniform as possible. Both lots were turned on grass pastures equal in size and in other conditions.

The pigs in lot I had an average initial weight of 33.02 kilograms and those in lot II, 33.13 kilograms.

Both lots were given a mixture of 60 parts rice bran, 15 parts corn, and 25 parts copra meal, with a nutritive ratio of 1:5.8. Lot I was given in addition a supply of camote vines daily, varying from two kilograms at the beginning to four kilograms at the close of the experiment. Owing to the limited supply, the pigs were never given as much camote vines as they could consume, but the amount given was maintained fairly uniform throughout the experiment. They received a total of 422 kilograms of camote vines during the period of 111 days.

Observations. The experiment was run for fifteen weeks and six days, or 111 days. No appreciable difference in the appetite of the pigs in the two lots was observed. Except for the difference in size and condition in favor of lot I, the pigs in the two lots did not differ greatly in appearance.

With regard to the soiling of the vines, the writers observed that the pigs fed on the tips of the vines first, then on the younger leaves, until all the leaves on the soft stem of the vines were consumed; and lastly they chewed even the hard woody portion of the vines. Allas (1924) reported similar observations.

The detailed results of the experiment are shown in table 1. It may be seen that the lot receiving camote vines as soilage gained 103 kilograms, while the pigs in the dry lot gained only 55.4 kilograms. In the soilage lot only 3.24 kilograms of grain were required for one kilogram of gain, while 6.02 kilograms were required in the dry lot, an advantage amounting to 85.8 per cent. Similarly the cost of gains in the soilage lot, without counting the cost of the vines, was considerably lower than in the dry lot, amounting to ₱0.22 a kilogram as against ₱0.42 for the dry lot pigs, a difference of ₱0.20.

TABLE 1

Showing the computed results of experiment I

	LOT I	LOT II
	Soiling camote with corn, rice, rice bran, and copra meal	Dry lot with corn, rice bran, and copra meal
Number of pigs	6	6
Duration of the experiment	111.00 days	111.00 days
Total initial weight	198.1 kgm.	198.8 kgm.
Total final weight	301.1 kgm.	254.2 kgm.
Total gain	103.0 kgm.	55.4 kgm.
Concentrates consumed:		
Corn	49.99 kgm.	49.99 kgm.
Rice bran	199.98 kgm.	199.98 kgm.
Copra meal	83.33 kgm.	83.33 kgm.
Total concentrate consumed	333.30 kgm.	333.30 kgm.
Cost of concentrate consumed:		
Corn.....at ₱0.088	₱ 4.40	₱ 4.40
Rice bran.....at ₱0.072	₱14.40	₱14.40
Copra meal.....at ₱0.050	₱ 4.17	₱ 4.17
Total cost of concentrate consumed	₱22.97	₱22.97
Concentrate consumed per kgm. gain	3.24 kgm.	6.02 kgm.
Concentrate consumed per 100 kgm. gain	323.59 kgm.	601.63 kgm.
Cost per kilogram gain	₱ 0.22	₱ 0.42
Cost of concentrate per 100 kgm. gain	₱22.30	₱42.54
Concentrate equivalent value of camote vines	286.34 kgm.	———
Cash value of vines at average cost of concentrate ₱0.069	₱19.76	———
Total weight of camote vine consumed	422.00 kgm.	———
Cash value of concentrate replaced by one kgm. camote vines	₱ 0.047	———

Experiment II

Object. The object of this experiment was to compare the value of camote as a pasture crop with common grass (*Paspalum dilatatum*) for growing breeding pigs on a ration consisting of rice bran, corn, and copra meal.

Plan. This experiment was started, July 15, 1924, as soon as new pastures of camote became available, and closed September 12, 1924, covering a period of 68 days.

Lot I, consisting of seven pigs, had an average initial weight of 14.20 kilograms. The pigs were placed on camote pasture. Lot II, consisting also of seven pigs, had an average initial weight of 14.23 kilograms. These pigs were turned into grass pasture. Drinking water was provided for both lots at noon. A shed sufficient to protect the pigs from the extreme heat of the sun was provided for each lot.

The pigs were turned into camote pasture A on July 15, and on August 10, when all the vines had been consumed, the pigs were moved to pasture B. It took the lot of pigs 26 days to finish camote pasture A.

Pasture B was a little better than pasture A, the stand of camote in this lot was about 50 per cent. The pigs were removed from pasture B September 18, 1924, when the camote vines were exhausted. This pasture lasted the pigs 38 days.

Feeding. The feeds and the method of feeding were the same as were followed in experiment I.

Description of the pastures. Two camote pastures were used in the experiment for lot I. The pastures were planted during the first week of January. It took one man and a bullock one and a half days to prepare and plant the two pastures. At ₱2.00 a day the cost would be ₱3.00.[2] The area of each lot was 635.56 square meters. The pasture was in a rather poor condition. The stand of camote in pasture A was estimated to be about 40 per cent, in pasture B, about 50 per cent.

Observations. The experiment was run for 9 weeks and 5 days, or 68 days. The experiment had to be closed at this time as there was no other camote pasture available.

The pigs in the camote pasture were observed at different times of the day. It was found that they grazed on the camote vines as well as on grass but showed a preference for the vines. This was noticed particularly in pasture A when the vines became rather scarce. When turned into pasture B the pigs showed a decided preference for camote to the grass growing between the vines. It was found also that during the first few days, early in the morning and in the afternoon before feeding, the pigs rooted considerably. During the rest of the day, they were observed to feed on the vines and root. As was noted in experiment I they fed on the tender part of the vines before the fibrous. This corroborates the observations of Lago (1924) and Allas (1924). Lago also found that during the first few days the pigs rooted considerably, but later, very little.

As the experiment progressed there was observed marked differences between the pigs in the two lots—in feeding, vigor, size, etc.

In general, judging from the appearance of the hair and skin, and from their grazing, the pigs in lot I were more vigorous and healthy than those of lot II. The lot I pigs looked larger, seemed healthier, more evenly fleshed, and thriftier than lot II pigs, which were rather lanky and spare. At the time of feeding, the pigs in lot I were more aggressive and were able to finish a meal within a shorter time than the pigs in lot II.

The results of pasturing camote are shown in table 2. Lot I gained 45.8 kilograms; lot II gained 21.3 kilograms. Lot I was 115 per cent more

[2] Computation made by Mr. José P. Esguerra, in charge of labor in the Department of Animal Husbandry.

efficient in making gains than lot II, making an average daily gain per head of 0.098 kilogram as against 0.044 kilogram for lot II.

TABLE 2

Showing the computed results of experiment II

	LOT I	LOT II
	Camote pasture with corn, rice bran, and copra meal	Grass lot with corn, rice bran, and copra meal
Number of pigs	7	7
Duration of experiment	68 days	68 days
Total initial weight	99.4 kgm.	99.6 kgm.
Total final weight	145.2 kgm.	120.9 kgm.
Total gain	45.8 kgm.	21.3 kgm.
Concentrates consumed:		
Corn	23.55 kgm.	23.55 kgm.
Rice bran	94.20 kgm.	94.20 kgm.
Copra meal	39.25 kgm.	39.25 kgm.
Total concentrates consumed	157.00 kgm.	157.00 kgm.
Cost of concentrates consumed:		
Corn.....at ₱0.088	₱ 2.07	₱ 2.07
Rice bran.....at ₱0.072	₱ 6.78	₱ 6.78
Copra meal....at ₱0.050	₱ 1.96	₱ 1.96
Total cost of feed consumed	₱10.81	₱10.81
Concentrate consumed per kgm. gain	3.43 kgm.	7.37 kgm.
Concentrate consumed per 100 kgm. gain	343.00 kgm.	737.09 kgm.
Cost of concentrate per kgm. gain	₱ 0.24	₱ 0.51
Cost of concentrate per 100 kgm. gain	₱23.60	₱50.75
Concentrate equivalent value of camote pasture	180.55 kgm.	———
Cash value of camote pasture at average cost of concentrate ₱0.069	₱12.45	———
Concentrate value credited to camote pasture per kgm. gain.	3.94 kgm.	———

With regard to the relative economy in gains made by the two lots, it took 3.43 kilograms of concentrates in lot I and 7.37 in lot II to make one kilogram gain. Basing calculations on the cost of concentrates, to make one kilogram gain it cost ₱0.24 in lot I and ₱0.51 in lot II. Compared with lot II, lot I made a saving of ₱0.27 worth of concentrates for every kilogram gain. In other words, the difference of 24.5 kilograms gain made between the two lots may be credited to the use of camote pasture. Since the use of camote pasture caused, directly or indirectly, the reduction of concentrates fed per kilogram gain from 7.38 kilograms in lot II to 3.43 kilograms in lot I, there is sufficient ground to credit the difference of 3.94 kilograms of concentrates saved to pasture. Had lot I been placed under feeding similar to lot II, or had lot II been fed until it gained the same

amount as lot I it would have required 337.55 kilograms of concentrates to make 45.8 kilograms gain. As it was, lot I actually required only 157 kilograms of concentrates to make the 45.8 kilograms gain, a saving of 180.55 kilograms of feed. The value of one eighth of a hectare pasture having 45 per cent camote stand, therefore, is equivalent to 180.55 kilograms in concentrate value. Had the stand been 100 per cent, its equivalent concentrate value would have been about 400 kilograms, which, if used to supplement the ration used in this experiment for the same class of pigs, is sufficient to make a gain of 116.6 kilograms of live weight pork. Basing calculations on the market prices of the corn, rice bran, and copra meal used to form the concentrate ration, the camote pasture saved ₱12.45 worth of feeds in lot I.

Experiment III

Objects. To determine the relative value of camote soilage and camote pasture for weanling pigs.

Plan. Ten male pigs were divided into two lots. Lot I was designated as pasture lot and placed in a camote pasture having an area of 625 square meters, and lot II as soilage lot was placed in a dry lot with an area of 150 square meters.

Ration. The basal ration consisted of the following:

Corn	8 parts
Rice bran	8 parts
Copra meal	4 parts
Shrimps	1 part
Molasses	In small amounts to flavor

To this ration was added one per cent of the mineral mixture.

Lot II received in addition about 5 kilograms of camote vines daily.

Observations. In general, pigs in lot I showed that they were thrifty and growthy and, by all indications, were developing, while the pigs in lot II were slightly smaller, but appeared more mature and finished than those of lot I.

Table 3 shows that the pasture lot gained 19.9 kilograms more than the soilage lot. The pigs on pasture gained faster than those on soilage. Lot I on soilage required 173.67 kilograms more concentrate to make 100 kilograms gain than was required by lot II on pasture.

The detailed results are shown in table 3.

TABLE 3

Showing the computed results of experiment III

	LOT I	LOT II
	Camote pasture with corn, rice bran, copra meal, and shrimps	Camote soilage with corn, rice bran, copra meal, molasses, and shrimps
Number of pigs	5	5
Duration of experiment	70 days	70 days
Total initial weight	70.60 kgm.	68.20 kgm.
Total final weight	128.20 kgm.	105.90 kgm.
Total gain	57.60 kgm.	37.70 kgm.
Concentrates consumed	207.02 kgm.	200.97 kgm.
Corn	70.86 kgm.	68.56 kgm.
Copra meal	35.43 kgm.	34.28 kgm.
Rice bran	70.86 kgm.	68.56 kgm.
Shrimps	8.87 kgm.	8.57 kgm.
Molasses	21.00 kgm.	21.00 kgm.
Camote vines	———	360.00 kgm.
Cost of concentrates consumed	₱15.94	₱15.31
Concentrate consumed per kgm. gain	3.59 kgm.	5.33 kgm.
Concentrate consumed per 100 kgm. gain	359.41 kgm.	533.08 kgm.
Cost of concentrate per kgm. gain	₱ 0.28	₱ 0.41
Cost of concentrate per 100 kgm. gain	₱27.67	₱40.61
Concentrate equivalent value of camote pasture	100.24 kgm.	———
Cash value of camote pasture at average cost of concentrate....₱0.069	₱ 6.92	———

To make one kilogram of gain took 3.59 kilograms of concentrate in the pasture lot and 5.33 kilograms in the soilage lot, a difference of 1.74 kilograms in favor of the pasture lot. The cost of the concentrate feed used per kilogram gain was less by 13 centavos in the pasture lot.

Summary

These experiments are preliminary in nature and the results obtained are presented to show the relative merits of camote pasture as compared with camote soilage, dry lots, and grassy lots growing only wild grasses, rather than to determine its exact equivalent value. The figures given should therefore be considered as only rough approximations of the true value of camote pasture. The reasons why they cannot be considered very accurate is that some of the pigs used died soon after the experiment and it is not likely that they were very normal during the period of observation. In all cases, however, both lots were treated similarly and no favor was shown any particular group.

Summarizing the results obtained, it is found:

1. That pigs on grass pastures did considerably better when given camote vines in the form of soilage in addition to the concentrate allowance.

2. That pigs on camote pasture with a concentrate allowance made more rapid gains than pigs on common grass (*Paspalum dilatatum*) pasture, receiving an identical concentrate ration.

3. That pigs on camote pasture fed a concentrate ration gained faster and more economically than pigs on dry lot receiving an identical concentrate allowance and camote vines in the form of soilage.

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PUBLISHED CONTRIBUTIONS OF THE COLLEGE OF AGRICULTURE: IV[1]

CHARLES FULLER BAKER
Dean, College of Agriculture

The "every-man-alive" character of the staff of the College of Agriculture is again well demonstrated in the intellectual output of published results for the past year. The spirit of inquiry permeates not only the entire faculty, but is also a constant inspiration to the student body as well. The most interesting and inspiring teachers who become real leaders of students are exactly those who are intellectually most alive and who are personally engaged in the immensely stimulating work of extending the boundaries of human thought and knowledge. Teachers cannot arouse or pass on inspirations and enthusiasms which do not burn in living fire in their own souls. I have had innumerable occasions to observe that students living and working in this atmosphere have no lack of sustained interest in their College work, and the onward march through their college courses becomes one of more and more intense interest in all lines of work affecting the development of agriculture in the Philippines and affecting the lives and interests of the Filipino people.

Every item of this output also means direct strengthening, amplifying, and focussing of the application, of the various courses now being given in the College, so that this all indicates with great clarity a tremendous growth within the College—a growth of vastly greater importance to this country than the erection of ornate buildings or development of material equipment, though these latter things have their place. The fact remains that the most important element of all is that of *men* and the minds within them, and we may well come down to the old definition of a real university as being in its simplest and most successful terms, "Mark Hopkins on one end of a log and a student on the other".

II: EXPERIMENT STATION CONTRIBUTIONS

The contributions are numbered serially as reported. For Nos. 1–199, *see* THE PHILIPPINE AGRICULTURIST XII, No. 7, December, 1923. For Nos. 200–287, *see* THE PHILIPPINE AGRICULTURIST XIII, No. 10, March,

[1]General contribution from the College of Agriculture No. 182.

1925. For Nos. 288–354, *see* THE PHILIPPINE AGRICULTURIST XIV, No. 10, March, 1926.

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(374) GONZALEZ, B. M. 1926. Weighing farm animals on a portable scale. The Philippine Agriculturist **15**: 149–157. *Fig. 1–3.*

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III: GENERAL CONTRIBUTIONS

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IV. CIRCULARS

The circulars are numbered serially as reported. For Nos. 1–5 *see* The Philippine Agriculturist, XIV, No. 10, March, 1926.

No. 6. Gonzalez, B. M., and A. F. Taleon. (Compilers.) 1926. (Mimeographed.) Conversion tables for common Philippine weights and measures including metric and English equivalents.

No. 7. Mendiola, Nemesio B. 1926. (Mimeographed.) How to produce new varieties of gumamela (Hibiscus).

No. 8. Villegas, Valente. 1926. Horse breeding in the Philippines. (See Experiment Station contribution No. 306.)

No. 9. Gonzalez, B. M., and J. P. Esguerra. 1926. Fences for farm animals. (See Experiment Station contribution No. 332).

No. 10. David, Pedro A. 1926. (Mimeographed.) (*Revised by Charles Fuller Baker, Dean, College of Agriculture*). Practical directions for coffee planting.

No. 11. Anonymous. 1926. The New College Copra Drier. (*Prepared in Department of Agricultural Chemistry with co-operation of Departments of Agronomy and Extension.*)

REVIEW: "INSECTS OF WESTERN NORTH AMERICA."[1]

This epoch marking book sets a new pace in entomological manuals. The field of entomological science is one of the most extensive of all biological sciences, due to the enormous number of species concerned (more than in all other animal groups put together) and to the infinite variety in structure, habits, and relationships. The ordinary student finds difficulty in getting any comprehensive conception of the field as a whole. In this book Professor Essig of the University of California has attempted the colossal task of building up a treatment of the economic and conspicuous insects of Western America, on a systematic and synoptical arrangement of the West American insects as a whole. As a first attempt for this great region, the book is a monumental success. The arrangement of its material is a triumph of book making. Its wealth of illustrations (largely original) vastly increases its interest, and this will stimulate its use by students. It is hoped that as knowledge of the subject grows this great work will continue to grow with it, in subsequent editions. In the meantime the synoptical treatment and wealth of material in the economic phases, will make it a standard reference work for students as well as specialists throughout the world.

Its dedication reads "To My Teachers and Friends, Dean Charles Fuller Baker and the late Doctor Albert John Cook."

[1]Essig, E. O. 1926. Insects of Western North America. 1035 p. 766 fig. New York: The Macmillan Company.

Some—indeed very few—are born men of science. Others achieve such a vocation; only they must be helped to it. Scientific genius appears where and when it pleases. Nature is not prodigal of wonders like an Archimedes, a Newton, an Einstein. All we can do is to look up to them as they shine and to give them any means of work they may want.

—L. Levy-Bruhl.

On the great clock of time there is but one word: Now!

—*Shakespeare.*

ABSTRACT[2]

Some factors affecting the growth of alfalfa in the Philippines. Federico Goseco. (*Thesis presented for graduation, 1925, from the College of Agriculture, No. 248; Experiment Station contribution, No. 435*). In a series of four experiments the author made a study on: (1) the effect of fertilizers on alfalfa; (2) the effect of lime; (3) the effect of inoculation; (4) the effect of drainage; (5) the effect of planting alfalfa at different times of the year. The work was conducted during the year 1924–1925 in the Forage Crop Field of the College. These experiments were as follows: I, twelve kerosene cans, three of them checks, in which were planted alfalfa, were treated with fertilizer and lime. One can received lime alone and the other eight were treated with fertilizer in combination with lime. II, the same treatment as I with seeds inoculated with alfalfa bacteria. III, six cans provided with perfect drainage but not fertilized, and with seeds inoculated. IV, in the field culture each plot was fertilized and planted each month to determine the effect of season. Seeds used in these experiments were of Peruvian variety and the bacteria used were procured from United States Department of Agriculture.

Results of these experiments were as follows: The first crop was harvested four months after planting. Experiment I which was not inoculated bore no flowers. Yield and stand of the crop were inferior to experiment I. Plants responded much more readily to phosphoric acid than to either nitrogen or potash. Lime with phosphoric acid gave the highest yield. Experiment II bore flowers and produced nodules. Increase in yield was especially evident in the can that received a complete fertilizer. The yield was higher than in experiment I. Experiment III showed that well-drained cans yielded higher than the fertilized can in experiment II. Experiment IV showed that November planting gave the heaviest yield and June gave the lightest. The factors favorable for November planting are uniform distribution of rainfall, low temperature (24.1°C.) and less attack of insect pests.

In connection with these experiments, the relative productivity of two varieties, Peruvian and Kansas, planted at a distance of 25 by 25 centimeters, was determined. After a period of five months the crop was harvested. The yield was favorable for the Peruvian variety. For seed production the author found that the presence of insect pollinizers and trippers are necessary. The insects, *Nomia quadrifociata* and *Megachile philippinensis*, are the common pollinizers of alfalfa.

—*Abstract by Marcelo V. Arnaldo.*

[2]Abstract prepared as part of required work in English 6, College of Agriculture.

EXCHANGE NOTES

Ducks have proven much more effective mosquito destroyers than fishes. In the experiments reported by Dr. S. G. Dixon, of Pennsylvania, two ponds, of 1,400 square feet each, were produced by dams on one stream, and 20 Mallard ducks were placed in one, while the other was well stocked with gold fish. For several months the duck's pond was entirely free from mosquitoes, which continued very abundant in the young stages in the other pond. The infested pond was then opened to 10 Mallard ducks, which first destroyed the tadpoles, and then ravenously devoured the mosquitoes in preference to any other food. In 24 hours no pupae could be found, while after 48 hours only a few larvæ survived.—(*From an old Journal.*)

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(Young Muscovy ducks effectually keep ponds and water holes clear of Mosquitoes, but with us they do not eat the tadpoles (young frogs) which would form a taste for them.—Ed.)

—*Agricultural Society* (Jamaica.)

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On August 1st, 1890, the first Arbor Day was held in South Australia. It has now become a fixed function in the schools, providing a means of interesting the children in tree culture.

The usual custom is to plant native trees, and it will no doubt remain so, but a departure, which at once opens up possibilities in conjunction with the elementary agriculture now being taught in the schools, is the substitution of fruit trees for the native trees.

This has been done this year by several of the schools in the South East. On June 4th, the Glenburnie School initiated the movement, and was closely followed by the Kalangadoo and Compton Schools.

The District Orchard Instructor (Mr. H. H. Orchard), in response to the requests of the School Committee, had charge of the proceedings. Following a brief address by the Headmaster on "Arbor Day," an address on the selection of the fruit trees and the theory of pruning the young tree, illustrated by blackboard diagrams, was given by the Instructor. Then adjourning to the area where the holes had been prepared beforehand, the correct planting with the aid of the planting-board was demonstrated. The balance of the trees were planted by the children under the supervision of the Instructor, and a similar procedure was adopted with the pruning.

From time to time it is intended to use these trees to demonstrate various orchard practices to the children.

On every occasion the presence of members of the School Committee added interest to the proceedings, and was no doubt a source of encouragement to the children.

—*Journal of Agriculture* (South Australia).

* * * The boy who has raised a ton litter of pigs or nursed a prize field of corn to maturity will never be satisfied to sit on a stool eight hours a day and add figures in a ledger. The lure of the typewriter does not appeal to the farm girl whose chickens have won the blue ribbon.

—*The Prairie Farmer* (Illinois).

It is not suggested that goats, either milch or Angora, should take the place of sheep or cattle, but that they would prove very profitable if run in conjunction, or on land and under conditions where it is not at present practicable or profitable to run other stock. On rough scrub country, as weed destroyers, and in the interior, goats prove their merit in a capacity which other stock are unable to do.

For suburban or country town residents who desire to have their own source of milk supply, goats will be found to fill that need, especially when conditions will not allow of a cow being kept. Goats can be tethered where desired, and so it is not necessary to have the land fenced, but water would be provided and a large box for shelter from wind, rain, and the sun. In this way they can be used to clean the ground as needed, there would be very little food wasted, and no risk of the animal becoming a nuisance to neighbours. The value of the milk will more than pay the cost of feed and attention needed.—E. F. Lane, at the State Conference of the Agricultural Bureau.

—*Agricultural Gazettee* (New South Wales).

The soybean acreage of Illinois has shown a remarkable increase during the past five years. Much of the credit for this increase is due to a group of enthusiastic growers in Champaign and Piatt counties. They have experimented with varieties, with cultural methods, and with different ways of harvesting the crop. They have grown soybeans for hay and for seed and for oil.

The more they have learned about the crop, the more these pioneer growers have come to believe that it is destined to gain a permanent place in corn belt rotations. Soybeans are particularly valuable as a substitute for oats.

—*The Prairie Farmer* (Illinois).

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* * * The way to get international coöperation is to coöperate, and this is only possible in a spirit of amity. Furthermore, all solutions for our problems depend on wisdom, which is the product of organized knowledge. Such wisdom may come from any quarter, and science cares nothing for official sanctions. In the spirit of science, discussion is free, and each man desires to impart what he knows instead of concealing it from motives of "policy".

—*The Scientific Monthly.*

COLLEGE AND ALUMNI NOTES

Sugar News, published in Manila, is the organ of the Philippine Sugar industry. According to its custom, each issue features the portrait and biography of some outstanding person in the local sugar industry or its related activities. The January, 1927, number of *Sugar News* is dedicated to our Dean. We think this a well-deserved compliment. Below a reproduction of his latest photograph appears the following outline of his active life:

Dean Charles Fuller Baker

Charles Fuller Baker was born in Lansing, Michigan, March, 1872. He was educated at the Michigan Agricultural College from which he obtained his degree of Bachelor of Science in 1891. Later he took a post graduate course at the Leland Stanford University obtaining his Master of Arts degree in 1903.

Dean Baker has devoted thirty-five years of service for the benefit and advancement of agriculture in general. He has taught for many years in various agricultural colleges and universities in the United States, and has seen service in Cuba, Nicaragua, Columbia, Brazil, and Malaya, where he conducted many field agricultural expeditions and surveys.

As an author there are many papers on botanical, entomological, and tropical agricultural subjects to his credit. He is a member of many technical and scientific societies, such as: the American Association for the Advancement of Science; American Association Econ. Entom.; Entom. Society America; Entom. Society Washington; New York Entomological Society; Southern California Academy of Science; Havana Academy Sciences; Soc. Linn. Lyon; Soc. Ent. France; Soc. Ent. Italiana; Deutsche Ent. Geschellsch.; and Soc. Ent. Belgique.

Since 1919 he has been Dean and Professor of Tropical Agriculture, College of Agriculture, University of the Philippines, and Director of the Experiment Station. The development of the Los Baños Agricultural College to its present standing has been due greatly to his energetic leadership. As dean of the College of Agriculture, he has rendered a great service to the Philippine sugar industry through the beneficial cooperation which the College has extended and is extending to the industry in the solution of its many problems.

Dean Baker has recently been granted leave for one year by the Board of Regents of the University of the Philippines. The *Sugar News* and his many other friends wish him an enjoyable vacation and an early return to these shores.

Mr. Hidrosollo, Director of the Bureau of Non-Christian Tribes, and recently appointed member of the Board of Regents of the University, as chairman of the Board committee on agriculture visited the College January 5 to study first hand certain proposed projects for the College. He was accompanied by Governor Gutierrez of Cotabato, who was enthusiastic in his expression of gratification at the healthy growth of the College since he last saw it.

In the *Proceedings of the Fourth Annual Convention of Philippine Sugar Association* we note that Doctor Roxas and Doctor Pendleton from this

College took active part in the discussions. Doctor Roxas presided in the sessions in which "Cane Varieties, Disease, and Fertilizers" were the topics for discussion. The following is quoted from "Experimental Work" in the *Proceedings:*

For the purpose of correlating the results of the field experiments with the soil conditions, the Philippine Sugar Association has engaged the services of Dr. Robert L. Pendleton, Professor of Soil Technology of the College of Agriculture, Los Baños, to make a soil survey of the various sugar districts in Negros. Dr. Pendleton made an extensive soil survey of Negros in April and May of this year, and the tracings, maps and classifications of the various types of soils surveyed are in course of preparation. When completed, these will be distributed among the members of the Association for their information.

Remarks in letters on Mendiola's "A Manual of Plant Breeding for the Tropics": From Prof. David L. Crawford, University of Hawaii, Honolulu:

Our Plant Breeding Department has ordered a copy of this book and until this arrives I have loaned my copy to that department. Professor Krauss has looked it over and speaks very highly of it as being a work of great merit.

From Mons. Paul Serre, Consul of France, Auckland, New Zealand:

Dr. Mendiola has made a name for himself in the scientific world. To begin with, I shall write an article on it for the Institute of Colonial Agronomy and the Academy of Agriculture of France. I regret that Dr. Mendiola had not seen my book, "Le Tabac de Cuba et les Cigares de la Havane (1911)—Agustin Challanel, publisher, 17 rue Jacob, Paris."

Two weeks of the Christmas vacation were used by Dr. Robert L. Pendleton in making a study of certain of the soils and agricultural conditions of the Calamba Sugar Estate, Canlubang, Laguna Province. A detailed soil survey of certain fields has been made, and a large number of samples have been collected for study in the laboratory. Three thesis students of the Soils Division—Alfonso Briones, Charoon Suebsaeng, and Roem Purnariksha—also assisted in the field work, getting material for use in their thesis work.

The January number of *The Makiling Echo*, the quarterly publication of the School of Forestry, offers an unusual number of articles of interest.

On the editorial page of the November number of *California Cultivator* appears under the caption "Philippine Agriculture" an excerpt from "Our Agricultural Policy should Center on the Food Supply", by Toribio Vibar, the editorial in THE PHILIPPINE AGRICULTURIST, July, 1926.

"Value to Farming of Philippine Soil Surveys" by Dr. Robert L. Pendleton of the Soils Division appeared in the December number of *The American Chamber of Commerce Journal.*

In the same journal there is a brief, forceful article on "Well-being and Happiness for the Average Filipino Farmer," signed "Extension Division, College of Agriculture." An extract from *Siam* on the efforts of the Government of Siam to encourage foreign capital carries this note:

Dean Baker of the college of agriculture, sending the above to the *Journal*, says: "This is remarkably significant when it is remembered that through the years Siam was gradually dismembered and robbed of territory by France and England and might have justly feared incursion of foreign capital. Quite to the contrary, foreign capital stabilized and crystallized her political status and hastened the definition of permanent boundaries."—Ed.

A letter to Dean Baker from the Division of Commerce, Buitenzorg, Java, contains the following:

Having come across a specimen number of your periodical "The Philippine Agriculturist" I was much interested in its contents and wonder whether you would agree in affording us a free subscription for the coming year in exchange for the following publications:

Report on commerce, industry and agriculture, 1925.

A series of booklets dealing on the different products of the Dutch East Indies, recently issued by this division.

This office is willing to provide your readers with more detailed information on request while the photographs besides other charts and graphs are available for your use if this might convenience you.

Professor Gonzalez, delegate to the Third Pan-Pacific Science Congress, brought from Japan thirty eggs of Nagoya breed of chickens. This is the common fowl of Japan. It is buff in color, considerably larger than the Philippine chicken, and is noted for its hardiness. The eggs were presented to him by the Imperial Zootechnical Experiment Station of Japan through its Director, Dr. K. Kimura. Doctor Fronda reports a hatch of fourteen vigorous chicks. So far as known this is the first attempt to introduce this breed into the Islands. It will be studied thoroughly for its possibilities in the Philippines as egg and meat producer, pure and graded with the Cantonese. The eggs were kept in the ship's vegetable refrigerator while en route.

Letters with Christmas and New Year's greetings were received by some faculty members from Mr. Thongdee Resanant, B. S. '24. Mr. Resanant is now teaching in the Agricultural Teacher's Training School at Tap Amang Station, Korat Line, Siam. He expressed regret that the school had not been going ahead rapidly owing to lack of funds. Things look better now "due to changes both in the head of the administration and kingship." Mr. Resanant states that the Crown Prince, who visited our College last semester, had words of praise for this institution.

A letter to Dean Baker from Mr. N. W. Sinclair, Manager, Mindoro Sugar Company, San José, has the following to say about one of our graduates, Mr. Pablo Quizon, B. Agr. '25.

Mr. Quizon is taking a leave of absence and, while in Luzon, plans to visit you with a view to explaining the nature and scope of his work with us in connection with our organized campaign of Rat Poisoning which promises much in saving a considerable portion of our crops.

It is a pleasure to state that Mr. Quizon has shown unusual originality in adapting the Hawaiian Poisoning plan to meet with local Philippine conditions and we know that you will be proud to hear that one of your graduates has embarked in a work of such possibilities and one which assures him of unusual opportunity to make a worth while reputation for himself in the business as well as in the sugar world.

The twenty-fourth scientific meeting of the Los Baños Biological Club was held on December 16, 1926, at 7:30 p. m. in the College of Agriculture Auditorium.

The following papers were read and discussed: Mr. Pedro A. Rodrigo —"Production of peanuts from cuttings." Dr. Bienvenido M. Gonzalez —"Observation on education and research in Japan—agricultural and general (with lantern slide illustrations)."

The annual Christmas Party given by the faculties of the Associated Colleges at Los Baños to the students remaining on the Campus during the holidays was given in the New Mess Hall, December 24. It was an afternoon and early evening affair. Under Mr. Dawis' skillful hands the dining hall was gay in red and green with several Christmas bells. A real pine Christmas tree from Baguio gave the finishing touch. In the afternoon there was dancing. The rigadon was revived with much merriment. After the buffet supper, the following program was given:

1. Welcome - - - - *Mr. Tongko, "Y" Secretary*
2. A Christmas Message - - - - - *Dean Baker*
3. "The First Christmas, according to St. Luke" - - - - - *Miss Adaline Pendleton*
4. "Souvenir"—Violin Solo - - - *Mr. V. Kilayko*
5. "The First Christmas Tree", by Henry Van Dyke - - - - - - - *Miss Emma S. Yule*
6. Christmas Pantomime to Music - - *All Star Cast*
7. Singing of Christmas Carols - - - - - *All*

The pantomime arranged and directed by Miss Wilson, of the English Department, gave in three episodes the old, old story of Bethlehem. During each episode a chorus sang softly appropriate hymns and carols, closing the beautiful pictures with "Silent Night" sung by Mrs. Pendleton, Doctor Pendleton's mother.

Much credit is due Mr. Villaluz for the artistic scenic background for the pantomime. Professor Roa with selections on the piano and his enthusiastic leading in the carol singing did much to give the party a real Christmas tone.

New Pledges for the College of Agriculture Alumni Hall

Total brought forward	₱2,000.00	
Teofilo F. Novero, '22	25.00	
Emilio C. Aquino, '23	50.00	
Baltazar Corcino, '22	6.00	
Julian Morada, '20	50.00	
Gil O. Opiana, '23	25.00	(additional)
Joaquin J. Gonzalez, '19	200.00	
Miguel A. Ortiz, '25	50.00	
Eutiquio Q. Zulaybar, '14	50.00	
Francisco A. Abadilla, '17	80.00	
Total to date	₱2,636.00	

New books added to the Library, College of Agriculture, from December 1 to 30, 1926.

Association of Official Seed Analysts.
Proceedings of the Association of Official Seed Analysts.

Beebe, W.
Jungle days. 1925.

Bishop, J. B. (ed.)
Theodore Roosevelt's letters to his children. 1926.

Bradbury, F.
Carpet manufacture. 1904.

Charabot, E.
Les productions végétales des colonies Françaises. 1908.

Coolidge, C.
The price of freedom; speeches and addresses. 1925.

Eichler, L.
Well-bred English. 1926.

Franklin, F.
Plain talks on economics. 1924.

Gage, H. S.
The microscope. 1925.

Hildebrand, A. S.
Blue water. 1923.

Kieffer, J. J.
Das tierreich-eine zusanmens-tellung und kennzeichningder rezenten tierformen. 1926.

Mills, D.
The book of the ancient world for younger readers. 1923.

Murasaki, Lady.
The tale of Genji. 1926.

Nitobe, I.
The Japanese nation, its land, its people, and its life with special consideration to its relation with U. S. 1912.
Nitobe, I.
Bushido, the soul of Japan. 1905.
Poultry Science, Vols. 1–2 and 3–4. 1921.
Russell, C. E.
The outlook for the Philippines. 1922.
Russell, C. E., and Rodriguez, B. E.
The hero of the Filipinos. 1923.
Rhys & Dawson, Scott (editors)
Twenty-nine love stories, old and new. 1925.
Revised administrative code of the P. I. of 1917. 1926.
Sabin, E. L.
Pluck on the long trail or boy scouts in the rockies. 1912.
Sorauer, P.
Handbuch der pflanzenkrankchiten. 1925.
Taussig, F. W.
The tariff history of the United States. 1923.
Thirty-third annual report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institute. 1919.
Tolstoi, Leo.
Anna Karenina. Vols. 1 and 2. 1926.

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